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ABSTRACT

This issue includes the following articles: "A Multi-Modal Analysis of Anaphora and Ellipsis" (Gerhard Jager); "Amount Quantification, Referentiality, and Long Wh-Movement" (Anthony Kroch); "Valency in Kannada: Evidence for Interpretive Morphology" (Jeffrey Lidz); "Vietnamese 'Morphology' and the Definition of Word" (Rolf Noyer); "The Conflict between Future Tense and Modality: The Case of 'Will' in English" (Anoop Sarkar); and "Predemonstrative Modifiers in Mandarin" (Alexander Williams). References are appended to each article. (KFT)

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Edited by:

Alexis Dimitriadis, Hikyoung Lee,
Christine Moisset and Alexander Williams

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A Multi-Modal Analysis of Anaphora and Ellipsis*

Gerhard Jäger

1. Introduction

The aim of the present paper is to outline a unified account of anaphora and ellipsis phenomena within the framework of Type Logical Categorial Grammar.[1] There is at least one conceptual and one empirical reason to pursue such a goal. Firstly, both phenomena are characterized by the fact that they re-use semantic resources that are also used elsewhere. This issue is discussed in detail in section 2. Secondly, they show a striking similarity in displaying the characteristic ambiguity between strict and sloppy readings. This supports the assumption that in fact the same mechanisms are at work in both cases.

(1) a. John washed his car, and Bill did, too.
    b. John washed his car, and Bill waxed it.

In (1a), the second conjunct can mean that Bill washed Bill's car or that he washed John's car. Similarly, (1b) is ambiguous between a reading where Bill waxed John's and one where he waxed his own car. In the latter reading, *it* is usually called a *paycheck pronoun* or a *lazy pronoun*.

There is also a fundamental difference between ellipsis and anaphora, however. While ellipses require a strong syntactic and semantic *parallelism* between their own linguistic environment and the environment of their antecedents, nothing comparable can be observed in the case of (nominal) anaphors. This is immediately obvious in the case of strict readings, but sloppy, i.e. lazy readings show a considerable amount of tolerance here, too.

(2) John already spent his paycheck, but in Bill's case, it hasn't been handed out yet.

Arguably, a sort of semantic/pragmatic parallelism can be observed here, but certainly there is no syntactic parallelism, *his paycheck* being an object and *it* a subject.

---

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[1] As introductions to this theory of grammar, the interested reader is referred to Carpenter 1997, Moortgat 1997, Morrill 1994.

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This observation is somewhat surprising in view of the fact that it is frequently assumed that ellipsis interpretation is based on the recognition of syntactic parallelism between source clause and target clause (as for instance in Dalrymple et al. 1991 or in Hobbs and Kehler 1997). If this is true, anaphora and ellipsis are fundamentally different phenomena. To put it the other way around, a unified account of anaphora and ellipsis cannot make reference to parallelism. Hence the parallelism constraints that undeniably show up cannot originate in the ellipsis interpretation module itself but have to be located elsewhere in grammar. This is not too bad after all, since contexts that license VP ellipsis—like coordinations, comparative construction, question-answer sequences etc.—display parallelism effects even when there is no ellipsis. Such a line of argumentation has the advantage that the ellipsis module doesn't have to account for contrasts like the following:

(3) Who washed his car?
   a. John did, although Bill already had.
   b. John did, and Bill did, too.

While (3b) only has a uniformly sloppy reading, the preferred reading of (3a) is the one where both John and Bill washed John's car. The availability of the latter reading rests on the fact that John's washing his car is unlikely in case Bill already washed John's car, but not in case of Bill having washed his own car. Since not contrast but similarity is required by the conjunction *and... too* in (3b), the corresponding reading is blocked. It strikes me as undesirable to give the syntax-semantics interface (which is arguably the locus of ellipsis interpretation) access to this kind of common sense knowledge. Thus the ellipsis interpretation module should give access to both readings in both cases.

2. Semantic Resources and Compositionality

If one assumes (a) a version of the Principle of Compositionality and (b) that meanings of natural language expressions can adequately be represented by means of expressions of the typed λ-calculus, one immediately arrives at the following claim (which is hardly more than a truism):

For each sign S consisting of n lexemes, in each of its readings there is an expression M of the typed λ-calculus with $x_1, \ldots, x_n$ occuring each exactly once such that

$$M[x_1 \leftarrow N_1, \ldots, x_n \leftarrow N_n] = S'$$

where S' represents the meaning of S and N_i the meaning of the i'th lexeme.

The term M can be said to represent the semantic structure of the sign. It is an obvious question to ask whether there are restrictions on the form of these structures in natural language semantics. It is uncontroversial to assume that every λ-operator should bind at least one variable occurrence. This disallows such unnatural meaning recipes like $((\lambda y.x_1)x_2)$, which would predict that the meaning of a sign can be completely independent of one of its lexical components.

A less obvious restriction that is frequently considered requires that each λ-operator in M binds at most one variable occurrence. This corresponds to the appealing intuition that each lexical resource is used exactly once. There are *prima facie* counterexamples to this view, but most of them can nevertheless be handled, as will be illustrated below. To do so, it is crucial to assume that the single-bind condition does not apply to lexical meanings. In the examples that will be discussed, (b) gives the meanings of the lexical items involved, (c) the desired sentence meaning after normalization, and (d) gives the term M in the sense of the definition above.

Reflexives

(4) a. John shaves himself.
b. $N_1 = j, N_2 = \mathit{shave}', N_3 = ?$
c. $S' = \mathit{shave}' j\ j$
d. $M = (\lambda y.x_2 yy)x_1$

At a first glance, the meaning of the subject is used twice here, while the meaning of the reflexive—whatever it may be—doesn't make any contribution at all. This puzzling situation can be overcome by assigning the meaning $\lambda T \lambda y.Tyy$ to the reflexive. Now the structure of the example gives rise to the meaning recipe $M = x_3 x_2 x_1$, which is perfect.[2]

Coordination Ellipsis

(5) a. John walks and talks.
b. $N_1 = j, N_2 = \mathit{walk}', N_3 = \mathit{and}', N_4 = \mathit{talk}'$
c. $S' = \mathit{and}'(\mathit{walk}'\ j)(\mathit{talk}'\ j)$
d. $M = (\lambda y.x_3(x_2 y)(x_4 y))x_1$

Here again the meaning of the subject occurs twice. We can handle this by giving *and* the meaning

$$\lambda x \lambda y \lambda z.\mathit{and}'(xz)(yz)$$

---

[2] This analysis of reflexivation was proposed at various places, witness Keenan and Faltz 1985, Szabolcsi 1989.

This is basically already proposed in Montague's PTQ system and generalized to other types in Partee and Rooth 1983.

Other kinds of anaphors and ellipses

(6) a. John claims that he will win.
b. $claim'(win'\ j)j$

Here the representation of the matrix subject occurs twice while the embedded subject completely disappears. Things are similar in the case of VP ellipsis:

(7) a. John walks, and Bill does, too.
b. $and'(walk'b)(walk'j)$

Apparently the whole VP of the first conjunct gets recycled here. There are several ways to deal with these constructions. The burden of multiplying meaning could be transferred to the lexical semantics of the pronoun *he* in (6), and similarly to the auxiliary *does* in (7). In the case of bound anaphors, this has been proposed by Szabolcsi 1989 and Dalrymple et al. 1997. However, these systems only capture pronouns that are syntactically bound. Since ellipsis phenomena are largely identical within one sentence and across sentence boundaries, syntactic binding is unlikely to extend to ellipsis.

A currently quite popular approach assumes that the output of meaning composition is an underspecified representation where each lexical resource is used exactly once. The final meaning is achieved by resolving the underspecification, thereby possibly identifying several subexpressions. A paradigmatic example of this idea is Dalrymple et al. 1991, where the compositional meaning of (7) is supposed to be $and(P\ b)(walk'j)$, with P representing the meaning of *does (,too)*. This parameter is, in a final step, nailed down to the meanings it is supposed to have by means of a system of term equations.

Although such an approach has many attractive features, it strikes me as desirable to incorporate the semantics of anaphora and ellipsis into the compositional machinery. The only way of doing so seems to lie in a relaxation of the prohibition against multiple binding in syntax. To estimate the consequences and intricacies of such a move, we have to have a closer look on the relation between meaning recipes and syntactic structure.

3. The Syntax-Semantics Interface in Categorial Grammar

Compositionality of Interpretation requires that each syntactic operation is accompanied by a corresponding operation on meanings. Categorial Grammar strengthens this idea by assuming that not only syntactic and semantic objects, but also syntactic and semantic operations each form an algebra, and that there is also a homomorphism from syntactic to semantic operations. In the type logical version of Categorial Grammar, the syntactic operations are taken to be theorems (valid sequents) of a logical calculus generated from a single axiom scheme by application of a small set of inference rules. Correspondingly, semantic operations are generated from a single combinatorial scheme by closure under certain operations.

Syntactic categories, i.e. formulae of the syntax logic in question, are recursively built from a finite set of atomic categories $AtForm$ by means of the connectives "/" (rightward looking implication), "\" (leftward looking implication) and "•" (product). A *sequent* is a derivation $\Gamma \Rightarrow A$, where Γ is a binary tree of formulae (written as a bracketed string), and A is a formula. To transform such a logic into a full-blown grammar, two further ingredients have to be added, namely a set of designated categories (usually simply $\{S\}$), and an assignment of at least one category to each lexical item. A sequence of lexical items is recognized as a sentence by this grammar iff a sequent of corresponding categories can be bracketed in such a way that a designated category is derivable. The simplest logic fitting into this framework is the non-associative Lambek Calculus **NL** (Lambek 1961) which only has the axiom of identity and inference rules introducing a logical connective either at the left-hand or at the right-hand side of a sequent. Lambek 1961 proved that we can add the Cut rule without increasing the set of derivable sequents.

On the semantic side, there is a set of types which is the closure of a finite set of atomic types under the operations "$\rightarrow$" (function space) and "$\circ$" (Cartesian product). The homomorphism leading from categories to types is a straightforward generalization from the one in Montague's PTQ system (Montague 1974), requiring that "\" and "/" are sent to "$\rightarrow$" and"•" to "$\circ$". The only basic semantic operations are the identity maps on the domain of each type. The operations on semantic operations are most transparently defined as manipulations of polynomials in the simply typed λ-calculus (with product and projections). There is a one-one correspondence between inference rules and semantic meta-operations (which is of course just an instance of the Curry-Howard correspondence). Hence syntax and semantics can be presented simultaneously by augmenting the premises of the sequents in the Gentzen-style presentation with variables and the conclusions with polynomials over these variables. The axioms and rules of **NL** are presented below, where $\Gamma[A]$ stands for a binary tree with A as one of its leafs, and $\Gamma[B]$ for the result of replacing A with B in Γ.

(8) $$\frac{}{x : A \Rightarrow x : A}\,[\mathrm{id}]$$

$$\frac{\Delta \Rightarrow t_1 : A \quad \Gamma[x : A] \Rightarrow t_2 : C}{\Gamma[\Delta] \Rightarrow t_{2\,[x\leftarrow t_1]} : C}\,[\mathrm{Cut}]$$

$$\frac{\Delta \Rightarrow t_1 : B \qquad \Gamma[x : A] \Rightarrow t_2 : C}{\Gamma[(y : A/B, \Delta)] \Rightarrow t_{2\,[x\leftarrow (y t_1)]} : C}\,[/\mathrm{L}]$$

$$\frac{(\Gamma, x : B) \Rightarrow t : A}{\Gamma \Rightarrow \lambda x.t : A/B}\,[/\mathrm{R}]$$

$$\frac{\Delta \Rightarrow t_1 : B \qquad \Gamma[x : A] \Rightarrow t_2 : C}{\Gamma[(\Delta, y : B\backslash A)] \Rightarrow t_{2\,[x\leftarrow (y t_1)]} : C}\,[\backslash\mathrm{L}]$$

$$\frac{(x : B, \Gamma) \Rightarrow t : A}{\Gamma \Rightarrow \lambda x.t : B\backslash A}\,[\backslash\mathrm{R}]$$

$$\frac{\Gamma[(x : A, y : B)] \Rightarrow t : C}{\Gamma[z : A \bullet B] \Rightarrow t_{[x\leftarrow\pi_1(z),\, y\leftarrow\pi_2(z)]} : C}\,[\bullet\mathrm{L}]$$

$$\frac{\Gamma \Rightarrow t_1 : A \qquad \Delta \Rightarrow t_2 : B}{(\Gamma, \Delta) \Rightarrow \langle t_1, t_2\rangle : A \bullet B}\,[\bullet\mathrm{R}]$$

Confining ourselves to product-free types, it is easy to see by an induction on the complexity of proofs that polynomials derived as meaning recipes are terms of a limited fragment of the typed λ-calculus obeying the following constraints (cf. van Benthem 1987)

1. Each sub-term contains a free variable,
2. no sub-term contains more than one occurrence of the same variable, and
3. each λ binds a free variable.

A more flexible system is achieved by allowing arbitrary rebracketing of the antecedent of a sequent. This is captured by the structural rule of associativity, which turns **NL** into the associative Lambek Calculus **L**:[3]

(9) $$\begin{array}{c} \Gamma[(\Delta, (\Pi, \Sigma))] \Rightarrow t : A \\ \hline\hline \Gamma[((\Delta, \Pi), \Sigma)] \Rightarrow t : A \end{array}\,[\mathrm{A}]$$

However, the meaning recipes derived by **L** still confirm the mentioned constraints.

---

[3] The double line indicates that the rule can be applied in both directions.

4. Contraction and Permutation

Consider a simple elliptic sentence like

(10) John walks, and Bill, too

Since the parallel elements in the first and the second conjunct are not adjacent to *and*, assigning a polymorphic type like $X \setminus X/X$ to the conjunction would not enable us to derive the sentence in **L**. Besides, a viable solution should be able to cope with examples like (11) too, where no particular lexical item can be made responsible for the phenomenon:

(11) John walks. Bill too.

Therefore it seems desirable to assign (10) a meaning recipe like

(12) $x_3(x_2x_1)(x_2x_4)$

which uses one variable twice. To derive (12) as semantic structure of (10), **L** has to be extended by the structural rules of *contraction* and *permutation* to **LPC**:

$$(13)\quad \frac{\Gamma[(x : A, y : A)] \Rightarrow t : B}{\Gamma[x : A] \Rightarrow t_{[y \leftarrow x]} : B}\,[C] \qquad \frac{\Gamma[(\Delta, \Pi)] \Rightarrow t : A}{\Gamma[(\Pi, \Delta)] \Rightarrow t : A}\,[P]$$

The essential steps of the derivation are (omitting brackets in the premises since these are redundant in **L**):

$$\begin{array}{c}
x : \mathbf{n}, y : \mathbf{n} \setminus \mathbf{s}, z : (\mathbf{s} \setminus \mathbf{s})/\mathbf{s}, u : \mathbf{n}, v : \mathbf{n} \setminus \mathbf{s} \;\Rightarrow\; z(vu)(yx) : \mathbf{s} \\
\hline
x : \mathbf{n}, y : \mathbf{n} \setminus \mathbf{s}, z : (\mathbf{s} \setminus \mathbf{s})/\mathbf{s}, v : \mathbf{n} \setminus \mathbf{s}, u : \mathbf{n} \;\Rightarrow\; z(vu)(yx) : \mathbf{s} \\
\hline
x : \mathbf{n}, y : \mathbf{n} \setminus \mathbf{s}, v : \mathbf{n} \setminus \mathbf{s}, z : (\mathbf{s} \setminus \mathbf{s})/\mathbf{s}, u : \mathbf{n} \;\Rightarrow\; z(vu)(yx) : \mathbf{s} \\
\hline
x : \mathbf{n}, y : \mathbf{n} \setminus \mathbf{s}, z : (\mathbf{s} \setminus \mathbf{s})/\mathbf{s}, u : \mathbf{n} \;\Rightarrow\; z(yu)(yx) : \mathbf{s}
\end{array}
\begin{array}{l} \\ [P] \\ [P] \\ [C] \end{array}$$

However, the unrestricted usage of contraction would lead to a heavy overgeneration. For instance, *John shows Mary* would be predicted to be a grammatical sentence with an interpretation like *John shows Mary herself.* More generally, in van Benthem 1991 it is shown that **LPC** based grammars only recognize regular languages, which makes them useless for linguistic purposes. Therefore we have to impose constraints on the applicability of these rules to avoid such a collapse.[4]

---

[4] Dalrymple et al. 1997 briefly consider the option to use the exponentials of Linear Logic for this purpose. While this is viable in their framework where the resource logic is used only for meaning assembly, it wouldn't be restrictive enough in a categorial setting.

5. A Multi-Modal System

Research in recent years has shown that none of the pure categorial logics (like **NL**, **L**, **LP** or **LPC**) is well-suited for a comprehensive description of natural language, each of them by itself being either too restrictive or too permissive. That's why combinations of several systems have attracted much attention. In the simplest case, such a multi-modal logic has more than one n-place product connective together with the corresponding residuation connectives. Each family is characterized by the usual logical rules and a set of characteristic structural rules. In more elaborate systems, these different modes of composition are allowed to communicate via certain *interaction postulates*. This allows for instance to distinguish between head adjunction and phrasal composition (cf. Moortgat and Oehrle 1996) or modeling discontinuity (Morrill 1995). This technique can be exploited to control the availability of contraction and permutation in the context of anaphora and ellipsis interpretation.

Pretheoretically, the proposal can be circumscribed as follows: Every node in a syntactic tree can be augmented by an arbitrary number of indices. Every index has itself a syntactic category and is marked with a polarity (+ or –). Anaphors carry a negative index of the appropriate category (N in the case of nominal anaphors, $N \setminus S$ in the case of VP anaphors) by means of a lexical specification. Every node in the tree can freely be augmented with a positive index of the same category. Positive indices can be moved to every node to their right. If a particular node simultaneously carries a positive index A and a negative index B such that $A \Rightarrow B$ is a theorem of our grammar logic, than both indices can be deleted.

To flesh this out formally, we propose to use a second mode of combination "$\sim$" (with corresponding residuation operations $\hookleftarrow$ and $\hookrightarrow$) besides concatenation. We augment **L** with the logical rules in (14) and the structural rules in (15), where $(\cdots)$ and $\{\cdots\}$ denote the bracketings corresponding to $\bullet$ and $\sim$ respectively. The new mode of combination is intended to capture the combination of a regular constituent with a (positive) index, ie. both $A \sim B$ and $\{A, B\}$ stand for B_{+A}. Leftward residuation corresponds to negative indexing, i.e. $A \hookrightarrow B \approx B_{-A}$, and [$\hookrightarrow$L] amounts to deletion of matching indices.

$$(14)\quad \frac{\Delta \Rightarrow t_1 : B \qquad \Gamma[x : A] \Rightarrow t_2 : C}{\Gamma[\{y : A \hookleftarrow B, \Delta\}] \Rightarrow t_{2\,[x \leftarrow (y t_1)]} : C}[\hookleftarrow L]$$

$$\frac{\{\Gamma, x : B\} \Rightarrow t : A}{\Gamma \Rightarrow \lambda x.t : A \hookleftarrow B}[\hookleftarrow R]$$

$$\dfrac{\Delta \Rightarrow t_1 : B \qquad \Gamma[x : A] \Rightarrow t_2 : C}{\Gamma[\{\Delta, y : B \hookrightarrow A\}] \Rightarrow t_{2\,[x \leftarrow (y t_1)]} : C}\,[\hookrightarrow L]$$

$$\dfrac{\{x : B, \Gamma\} \Rightarrow t : A}{\Gamma \Rightarrow \lambda x.t : B \hookrightarrow A}\,[\hookrightarrow R]$$

$$\dfrac{\Gamma[\{x : A, y : B\}] \Rightarrow t : C}{\Gamma[z : A \sim B] \Rightarrow t_{[x \leftarrow \pi_1(z), y \leftarrow \pi_2(z)]} : C}\,[\sim L]$$

$$\dfrac{\Gamma \Rightarrow t_1 : A \qquad \Delta \Rightarrow t_2 : B}{\{\Gamma, \Delta\} \Rightarrow \langle t_1, t_2 \rangle : A \sim B}\,[\sim R]$$

In (15) the structural rules for the hybrid system **LA** (Lambek Calculus with Anaphora) are given. Allowing contraction for $\sim$ amounts to free indexing of any constituent (with a positive index). Index movement (IM) is formalized by an appropriate interaction postulate between $\bullet$ and $\sim$. The structural rule (P) ensures that the collection of indices attached to a node are unordered, i.e. they form a multiset.

(15) $$\dfrac{\Gamma[\{x : A, y : A\}] \Rightarrow t : B}{\Gamma[y : A] \Rightarrow t_{[x \leftarrow y]} : B}\,[C]$$

$$\dfrac{\Gamma[(\Delta, \{\Pi, \Theta\})] \Rightarrow t : A}{\Gamma[(\{\Pi, \Delta\}, \Theta)] \Rightarrow t : A}\,[IM]$$

$$\dfrac{\Gamma[\{\Pi, \{\Sigma, \Delta\}\}] \Rightarrow t : A}{\Gamma[\{\Sigma, \{\Pi, \Delta\}\}] \Rightarrow t : A}\,[P]$$

6. VP Ellipsis

To illustrate the system with a simple example, take the sentence

(16) John walks, and Bill does, too.

Informally, *does* gets a negative VP index from the lexicon. Semantically, it is interpreted as the identity function on VP meanings. In a first step, the VP *walks* gets a positive VP index with the same meaning as its host. In a second step, this index is moved to the second conjunct, where it is finally matched against the negative index and both are erased, resulting in application of the meaning of *does* to the meaning of the index. Formally, we assume the following lexical assignment:

(17) • John–j : **n**

- Bill–*b* : $\mathbf{n}$
- walks–*walk'* : $\mathbf{n} \setminus \mathbf{s}$
- and–*and'* : $(\mathbf{s} \setminus \mathbf{s})/\mathbf{s}$
- does–$\lambda x.x$: $(\mathbf{n} \setminus \mathbf{s}) \hookrightarrow (\mathbf{n} \setminus \mathbf{s})$

In detail, the derivation looks as follows (the order is reversed since the derivation ends with the sequent to be proved, while we started with it in the informal description). We start with a sequent that is derivable in **L** (where parentheses are tacitly assumed to be left-associative):

$$x : \mathbf{n}, y : \mathbf{n} \setminus \mathbf{s}, z : (\mathbf{s} \setminus \mathbf{s})/\mathbf{s}, w : \mathbf{n}, r : (\mathbf{n} \setminus \mathbf{s}) \\ \Rightarrow z(rw)(yx) : \mathbf{s}$$

L$\hookrightarrow$ splits the second VP into a negatively indexed VP and a positive VP-index:

$$x : \mathbf{n}, y : \mathbf{n} \setminus \mathbf{s}, z : (\mathbf{s} \setminus \mathbf{s})/\mathbf{s}, w : \mathbf{n}, \{v : \mathbf{n} \setminus \mathbf{s}, u : (\mathbf{n} \setminus \mathbf{s}) \hookrightarrow (\mathbf{n} \setminus \mathbf{s})\} \\ \Rightarrow z(uvw)(yx) : \mathbf{s}$$

Associativity of concatenation allows rebracketing:

$$x : \mathbf{n}, y : \mathbf{n} \setminus \mathbf{s}, z : (\mathbf{s} \setminus \mathbf{s})/\mathbf{s}, (w : \mathbf{n}, \{v : \mathbf{n} \setminus \mathbf{s}, u : (\mathbf{n} \setminus \mathbf{s}) \hookrightarrow (\mathbf{n} \setminus \mathbf{s})\}) \\ \Rightarrow z(uvw)(yx) : \mathbf{s}$$

IM moves the positive VP index to the left

$$x : \mathbf{n}, y : \mathbf{n} \setminus \mathbf{s}, z : (\mathbf{s} \setminus \mathbf{s})/\mathbf{s}, (\{v : \mathbf{n} \setminus \mathbf{s}, w : \mathbf{n}\}, u : (\mathbf{n} \setminus \mathbf{s}) \hookrightarrow (\mathbf{n} \setminus \mathbf{s})) \\ \Rightarrow z(uvw)(yx) : \mathbf{s}$$

Another application of associativity gives us

$$x : \mathbf{n}, y : \mathbf{n} \setminus \mathbf{s}, z : (\mathbf{s} \setminus \mathbf{s})/\mathbf{s}, \{v : \mathbf{n} \setminus \mathbf{s}, w : \mathbf{n}\}, u : (\mathbf{n} \setminus \mathbf{s}) \hookrightarrow (\mathbf{n} \setminus \mathbf{s}) \\ \Rightarrow z(uvw)(yx) : \mathbf{s}$$

In sum, the last three steps amount to moving the index one item to the left. If we repeat this two more times, we get

$$x : \mathbf{n}, \{v : \mathbf{n} \setminus \mathbf{s}, y : \mathbf{n} \setminus \mathbf{s}\}, z : (\mathbf{s} \setminus \mathbf{s})/\mathbf{s}, w : \mathbf{n}, u : (\mathbf{n} \setminus \mathbf{s}) \hookrightarrow (\mathbf{n} \setminus \mathbf{s}) \\ \Rightarrow z(uvw)(yx) : \mathbf{s}$$

Now we have a VP carrying a positive VP index, and we can apply contraction, thereby identifying the meaning of host VP and index.

(18) $$x : \mathbf{n}, y : \mathbf{n} \setminus \mathbf{s}, z : (\mathbf{s} \setminus \mathbf{s})/\mathbf{s}, w : \mathbf{n}, u : (\mathbf{n} \setminus \mathbf{s}) \hookrightarrow (\mathbf{n} \setminus \mathbf{s}) \Rightarrow z(uyw)(yx) : \mathbf{s}$$

After inserting the lexical meanings, we obtain the reading

$$and'((\lambda x.x)walk'\ b)(walk'\ j)$$

which reduces to

$$and'(walk'\ b)(walk'\ j)$$

The mechanism works similar in the case of nominal anaphors. Since a possessive pronoun like *his* behaves like a definite determiner except that it requires a nominal antecedent, the type assignment $\mathbf{n} \hookrightarrow (\mathbf{n}/\mathbf{cn})$ seems appropriate. So we assume the following lexical entries:

(19)
- washed–$wash : (\mathbf{n} \setminus \mathbf{s})/\mathbf{n}$
- his–$\lambda xy.of'\ y\ x : \mathbf{n} \hookrightarrow (\mathbf{n}/\mathbf{cn})$
- car–$car' : \mathbf{cn}$

We derive the reading (20c) for (20a), corresponding to the provable sequent (20b). The derivation is given in figure 1.

(20) a. John washed his car.
b. $x : \mathbf{n}, y : (\mathbf{n} \setminus \mathbf{s})/\mathbf{n}, z : \mathbf{n} \hookrightarrow (\mathbf{n}/\mathbf{cn}), w : \mathbf{cn} \Rightarrow y(zxw)x : \mathbf{s}$
c. $wash'((\lambda xy.of'\ y\ x)j\ car')j\ (= wash'(of'\ car'\ j)j)$

Before we proceed to the interaction of VP ellipsis and anaphora, observe that (20) shows a spurious ambiguity. After (20b) is derived, we can either stop or apply the rule "\L", which gives us the sequent

(21) $$y : (\mathbf{n} \setminus \mathbf{s})/\mathbf{s}, z : \mathbf{n} \hookrightarrow (\mathbf{n}/\mathbf{cn}), w : \mathbf{cn} \Rightarrow \lambda x.y(zxw)x : \mathbf{n} \setminus \mathbf{s}$$

This means that it is possible to resolve the anaphor *his* against the subject argument place of *washed*, assigning the meaning $\lambda x.wash'(of'\ car'\ x)x$ to the VP *washed his car*. In terms of indices, this means that not only overt constituents but also open argument places license the introduction of positive indices.[5] In (20) this ambiguity is spurious since after combining this VP with the subject *John*, we end up with the meaning (20c) again.

(22) John washed his car, and Bill did, too.

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[5] This can be seen as a reconstruction of Reinhart's 1983 distinction between coreferential and bound pronouns.

In (22), on the other hand, this ambiguity, though spurious in the first conjunct, makes a difference for the interpretation of the second one. If we plug in (21) into the conclusion of (16) via the Cut rule, we immediately derive the sloppy reading of (22). This amounts to first resolving *his* against the subject argument place of *washed* and afterward resolving *did* against the VP derived in this way. If, on the other hand, *his* is resolved against *John* prior to resolution of *did*, the strict reading results.

Dalrymple et al. 1991 present an example of a cascaded ellipsis that allows us to distinguish different ellipsis theories on a very fine-grained level.[6]

(23) John revised his paper before the teacher did, and Bill did, too.

Only those readings are considered where the first occurrence of *his* refers back to *John*, and the second *did* to the whole first conjunct. For simplicity, we treat *the teacher* as a proper noun with meaning *t* here. *Before* is analyzed on a par with *and* in the previous example. We use abbreviations like *JJBB* for the reading where John revised **John's** paper before the teacher revised **John's** paper and Bill revised **Bill's** paper before the teacher revised **Bill's** paper.

By combining the VP derivation in (21) with the VP ellipis structure in (18) by means of Cut and subsequently applying "R\" we obtain the semantic term

$$\lambda x.\mathit{before'}(\mathit{revise'}(\mathit{of'paper'}t)t)(\mathit{revise'}(\mathit{of'paper'}x)x)$$

for the VP *revised his paper before the teacher did.* Combining this again with (18) by means of Cut gives us the uniformly sloppy reading *JTBT*.

Starting proof search with with resolving *his* against John and resolving the two VP ellipses afterwards results in the uniformly strict reading *JJJJ*.

The derivation of *JJBB* is a bit more involved. First observe that the following sequent is valid, corresponding to the strict reading of the first conjunct:

$$x : \mathbf{n}, r : (\mathbf{n} \setminus \mathbf{s})/\mathbf{n}, h : \mathbf{n} \hookrightarrow (\mathbf{n}/\mathbf{cn})p : \mathbf{cn}, b : (\mathbf{s} \setminus \mathbf{s})/\mathbf{s}, t : \mathbf{n},$$

$$d : (\mathbf{n} \setminus \mathbf{s}) \hookrightarrow (\mathbf{n} \setminus \mathbf{s}) \Rightarrow b(d(r(h\ x\ p)t))(r(h\ x\ p)x) : \mathbf{s}$$

Applying "\R" to this sequent and inserting lexical entries gives us the reading

$$\lambda x.\mathit{before'}(\mathit{revise'}(\mathit{of'paper'}x)t)(\mathit{revise'}(\mathit{of'paper'}x)x) : \mathbf{n} \setminus \mathbf{s}$$

for *revised his paper before the teacher did.* This in turn serves as antecedent for the second *did*, resulting finally in the *JJBB* reading.

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[6] The remainder of this section serves to compare the predictions of the present theory with the HOU approach and is not essential for the rest of the paper.

Recall that for index matching not identity is required but derivability of the negative from the positive index (this follows immediately from "$\hookrightarrow$L"). This is exploited in *JTJT*. In a first step, *revised his paper* is recognized as a VP with an unresolved anaphor, i.e. category $\mathbf{n} \hookrightarrow (\mathbf{n} \setminus \mathbf{s})$ with the reading

$$\lambda xy.revise'(of'paper'x)y$$

This is copied to a positive index, which is in turn moved to the first *did*. Since

$$v : \mathbf{n} \hookrightarrow (\mathbf{n} \setminus \mathbf{s}) \Rightarrow \lambda x.v\,x\,x : \mathbf{n} \setminus \mathbf{s}$$

is a theorem of **LA**, the negative VP index of *did* can be discharged by using the result of applying this operation to the positive index, resulting in a sloppy reading for *the teacher did*. The anaphor *his* is still free to be resolved against *John*, giving us the *JT* reading for the first conjunct. Resolving the second *did* finally results in *JTJT*.

Chosing a strict reading for the first ellipsis (i.e. a reading *JJ??*) severely restricts the possible interpretations of the second one. Resolution of the first *did* can only take place after *his* is resolved, be it against *John* or against a hypothetical variable to be abstracted away later. The former results in *JJJJ*, the latter in *JJBB*. No further options are available. Hence neither *JJBJ* nor *JJJB* can be derived in the present theory.

This result is not too bad since the four predicted readings unequivocally exist and *JJJB* is definitely impossible. Native speaker intuitions differ with respect to *JJBJ*. It is unavailable with the example (23), but Dalrymple et al. 1991 claim that it improves in the structurally equivalent example (24):

(24) Dewey announced his victory after the newspaper did, but so did Truman.

7. Associativity?

In view of the considerations in section 1, the theory seems to be too restrictive in its present form. In particular, it excludes the mixed sloppy/strict reading in (25) (from Dahl 1974):

(25) John realizes that he is a fool, but Bill does not, even though his wife does.

An obvious way to relax the constraints of the theory is to allow a lexical assignment like

(26) does–$\lambda x.x : (\mathbf{n} \hookrightarrow (\mathbf{n} \setminus \mathbf{s})) \hookrightarrow (\mathbf{n} \hookrightarrow (\mathbf{n} \setminus \mathbf{s}))$

for the first *does*. This would enable us to resolve it against *realizes that he is a fool* before *he* is resolved. In this way, the silent *he* can be resolved independently from the overt one, yielding (among others) the desired reading.

While it seems to be *ad hoc* to assume such a lexical ambiguity for *does*, this type assignment can be derived if we add a version of the Geach Rule to our calculus:

$$x : A \hookrightarrow B \ \Rightarrow\ \lambda yz.x(yz) : (C \hookrightarrow A) \hookrightarrow (C \hookrightarrow B)$$

Inserting the identity function (as the lexical meaning of *does*) for x gives us the semantic term $\lambda yz.yz$ for the derived category, which is equivalent to $\lambda y.y$. In terms of sequent rules, this amounts to extending **LA** to a new system, call it **LAA**, which includes the structural rule of Associativity for both modes of combination:

(27) $$\frac{\Gamma[\{\Delta, \{\Pi, \Sigma\}\}] \Rightarrow t : A}{\Gamma[\{\{\Delta, \Pi\}, \Sigma\}] \Rightarrow t : A}[A\sim]$$

The decision between **LA** and **LAA** as appropriate calculus for anaphora and ellipsis is an empirical issue that has to be decided for each class of phenomena separately.

As far as English VP ellipsis is concerned, **LAA** predicts a very high degree of freedom. Besides the six readings for (23), it also admits readings like *JTTT* etc. Two comments are in order here. First, something similar to *JTTT* seems to be marginally possible indeed (judgments range from "impossible" to "perfect"):

(28) [Every bum on the streets of New York]$_j$ is more concerned about his$_j$ safety than this crowd loving president Clinton$_i$ is.

a. Fortunately for him$_i$, his$_i$ bodyguard is too.

b. Fortunately for him$_i$, his$_i$ bodyguard is more concerned about his$_i$ safety than he$_i$ is concerned about his$_i$ safety.

Second, restrictions on anaphora resolution in constructions without ellipsis do not substantially differ from those with ellipsis. (29) shows exactly the same range of readings like (23).

(29) John revised his paper before the teacher revised his paper, and Bill revised his paper before the teacher revised his paper, too.

If *too* is understood as establishing a parallelism between *John* and *Bill*, we have just the same four or five readings we have in (23). This fact is well-known (see for instance Gardent 1997). One way to account for this is the assumption that the deaccenting of the VPs in (29) that correspond to the elided material in (23) is the primary cause for this similarity. Ellipsis and deaccenting could be analyzed as largely two instances of the same phenomenon. Nevertheless another perspective is possible as well. The restrictions on anaphoric relationships that show up could be analyzed as consequences of the semantics/pragmatics of *too*, which simultaneously requires deaccenting of the second conjunct. This would make the differences between *and ... too*, *but*, *even though* etc. less mysterious. If such a line of research proves to be successful, this would allow a highly unrestrictive theory of ellipsis interpretation like the one implied by **LAA**.

An **LAA** based account seems definitely be preferable in the case of nominal anaphors, since this automatically captures *paycheck* pronouns.

(30) a. Bill spent his money, and John saved it.

b.
- spent–*spend'* : $(\mathbf{n} \backslash \mathbf{s})/\mathbf{n}$
- saved–*save'* : $(\mathbf{n} \backslash \mathbf{s})/\mathbf{n}$
- money–*money'* : $\mathbf{cn}$

c. $and'(save'(of'money'j)j)(spend'(of'money'b)b)$

The crucial part of the derivation is given in figure 2. Most importantly, *it* can get the derived category $(\mathbf{n} \hookrightarrow \mathbf{n}) \hookrightarrow (\mathbf{n} \hookrightarrow \mathbf{n})$, again with the interpretation as identity functions (over Skolem functions). Hence *his money* with the pronoun still unresolved (which denotes the Skolem function from individuals to their cars) can serve as antecedent for *it*.

In the case of stripping, **LA** seems to be the appropriate logic, although judgments are somewhat fuzzy here. In (31a) all contextual factors favor a mixed sloppy/strict reading (as indicated in (31b)), which is nevertheless only very marginally possible.[7]

(31) a. Every candidate believes that he can win, even Smith, but not his wife.

b. Every candidate believes that he can win, even Smith believes that he can win, but his wife does not believe that Smith can win.

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[7] Native speakers of German reject the corresponding example altogether.

8. Comparison with Jacobson's Theory of Anaphora

There is a striking correspondence between the present proposal and Jacobson's theory of anaphora (cf. Jacobson 1992b, Jacobson 1994, Jacobson 1996). Technically, the difference between this theory and the **LA**-based one is just the difference between the combinatory and type-logical variant of Categorial Grammar. Recall that in Combinatory Categorial Grammar, we have just the product free types of **L**. The axiom scheme of **L** is an axiom scheme in CCG as well. The main point of departure lies in the inference rules that can be used. Every version of CCG uses "/L", "\L" and "Cut", while "/R" and "\R" are not available. Besides, this deductive system can be extended by other axioms or axiom schemes, some of which are derivable in **L**, some aren't. Jacobson extends this basic system with a new type forming connective that corresponds to $\hookrightarrow$ in **LA**. Its behavior is governed by the following rules:

(32) a. $x : A/B \Rightarrow \lambda yz.x(yz) : (C \hookrightarrow A)/(C \hookrightarrow B)$
b. $x : A \setminus B \Rightarrow \lambda yz.x(yz) : (C \hookrightarrow A) \setminus (C \hookrightarrow B)$
c. $f : A \setminus (B \setminus C) \Rightarrow \lambda gx.f(gx)x : (B \hookrightarrow A) \setminus (B \setminus C)$
d. $f : (C/B)/A \Rightarrow \lambda gx.f(gx)x : (C/B)/(B \hookrightarrow A)$
e. $f : A \setminus (C/B) \Rightarrow \lambda gx.f(gx)x : (B \hookrightarrow A) \setminus (C/B)$
f. $f : (B \setminus C)/A \Rightarrow \lambda gx.f(gx)x : (B \setminus C)/(B \hookrightarrow A)$

With the exception of (32d) and (32e), these rules are theorems of **LA**. Extending **LA** with a mirror image of "IM" would even capture all of them. Since neither (32d) nor (32e) are used in Jacobson's analyses, this means that her results on Bach-Peters sentences, i-within-i effects, functional questions and right node raising carry over to the present approach without problems. This does not hold, however, for her approach to ACD (Jacobson 1992a) and to weak crossover phenomena.

On the other hand, our approach copes with VP ellipsis in a way that is not viable in Jacobson's system. In its published form, it does not recognize (1a) as a grammatical sentence if we use our lexical assignment. This can be fixed by minor amendments (for instance by assigning *and* the category $((\mathbf{n} \setminus \mathbf{s}) \setminus (\mathbf{n} \setminus \mathbf{s}))/\mathbf{s}$ and the meaning $\lambda pVx.and'p(Vx)$), but this would generate only the sloppy reading. At the present point it is still an open question which revisions would enable Jacobson's system to generate all readings of ellipses constructions. It is not unlikely that we in fact need the full power of conditionalization to achieve this goal (recall that the presence vs. absence of conditionalization is the crucial difference between type logical grammar and CCG). So future work has to show whether and how the advantages of the combinatory and the type-logical approach can be combined.

9. Conclusion and Further Research

In this paper, I have outlined a theory of anaphora and ellipsis which shows two desirable properties from a conceptual point of view:

- The semantics is fully compositional. As a consequence, there is no need for a level of Logical Form where ellipsis resolution takes place. Since ellipsis phenomena are usually considered to be a strong indication for the presence of LF, this might have consequences for grammar architecture as a whole. Neither does the theory presented here crucially depend on the typed λ-calculus as a semantic representation language. That it has been used throughout the paper is merely a matter of convenience; everything could be reformulated in terms of set theory or Combinatory Logic without loss of generality.
- The theory is variable free. This removes a great deal of arbitrariness from semantic derivations. In traditional theories, anaphors and ellipses are translated as variables (i.e. they denote functions from assignment functions to objects of the appropriate type). Since there are infinitely many variables, one and the same pronoun is predicted to be infinitely ambiguous. Though this is compatible with the letter of the Principle of Compositionality, it is clearly against its spirit, since identical expressions with identical syntactic structure should have identical denotations. Here, resolution ambiguities are treated as structural ambiguities, corresponding to essentially different proofs of the same sequent.

Let me conclude with a list of open questions that have to be addressed by further research.

The lexical type assignment hasn't been discussed yet. While it seems reasonable to treat nominal anaphors as identity functions over individuals with the syntactic category $\mathbf{n} \hookrightarrow \mathbf{n}$ by lexical stipulation, the similar assumption for English auxiliaries is less obvious, and the stripping cases cannot be handled in this way at all. To deal with examples as in (33), we have to assign the type $(\mathbf{n} \backslash \mathbf{s}) \hookrightarrow \mathbf{s}$ to *Bill*.

(33) John walks, and Bill too.

Doing this in the lexicon would be completely *ad hoc*. This assignment could be derived from the basic type $\mathbf{n}$ if the following rule were a theorem:

$$\dfrac{\dfrac{\dfrac{\mathbf{n} \Rightarrow \mathbf{n} \quad \mathbf{n}, \mathbf{n} \backslash \mathbf{s}/\mathbf{n}, \mathbf{n}/\mathbf{cn}, \mathbf{cn} \Rightarrow \mathbf{s}}{\mathbf{n}, \mathbf{n} \backslash \mathbf{s}/\mathbf{n}, \{\mathbf{n}, \mathbf{n} \hookrightarrow (\mathbf{n}/\mathbf{cn}), \mathbf{cn}\} \Rightarrow \mathbf{s}}{\scriptstyle[L\hookrightarrow]}}{\{\mathbf{n}, \mathbf{n}\}, \mathbf{n} \backslash \mathbf{s}/\mathbf{n}, \mathbf{n} \hookrightarrow (\mathbf{n}/\mathbf{cn}), \mathbf{cn} \Rightarrow \mathbf{s}}{\scriptstyle[IM+Ass]}}{\mathbf{n}, \mathbf{n} \backslash \mathbf{s}/\mathbf{n}, \mathbf{n} \hookrightarrow (\mathbf{n}/\mathbf{cn}), \mathbf{cn} \Rightarrow \mathbf{s}}{\scriptstyle[C]}$$

Figure 1: Partial Derivation of *John washed his car*

$$\dfrac{\dfrac{\dfrac{\dfrac{\{\{\mathbf{n}, \mathbf{n} \hookrightarrow \mathbf{n}\}, \mathbf{n} \hookrightarrow \mathbf{n}\} \Rightarrow \mathbf{n}}{\{\mathbf{n}, \{\mathbf{n} \hookrightarrow \mathbf{n}, \mathbf{n} \hookrightarrow \mathbf{n}\}\} \Rightarrow \mathbf{n}}{\scriptstyle[A\sim]}}{\{\mathbf{n} \hookrightarrow \mathbf{n}, \mathbf{n} \hookrightarrow \mathbf{n}\} \Rightarrow \mathbf{n} \hookrightarrow \mathbf{n}}{\scriptstyle[\hookrightarrow R]}}{\mathbf{n} \hookrightarrow \mathbf{n} \Rightarrow (\mathbf{n} \hookrightarrow \mathbf{n}) \hookrightarrow (\mathbf{n} \hookrightarrow \mathbf{n})}{\scriptstyle[\hookrightarrow R]} \quad \dfrac{\dfrac{\mathbf{n} \hookrightarrow \mathbf{n} \Rightarrow \mathbf{n} \hookrightarrow \mathbf{n} \quad \dfrac{\dfrac{\mathbf{n} \Rightarrow \mathbf{n} \quad \mathbf{n}, \mathbf{n} \backslash \mathbf{s}/\mathbf{n}, \mathbf{n} \Rightarrow \mathbf{s}}{\{\mathbf{n}, \mathbf{n}\}, \mathbf{n} \backslash \mathbf{s}/\mathbf{n}, \mathbf{n} \hookrightarrow \mathbf{n} \Rightarrow \mathbf{s}}{\scriptstyle[\hookrightarrow L+IM+IP]}}{\mathbf{n}, \mathbf{n} \backslash \mathbf{s}/\mathbf{n}, \mathbf{n} \hookrightarrow \mathbf{n} \Rightarrow \mathbf{s}}{\scriptstyle[C]}}{\{\mathbf{n} \hookrightarrow \mathbf{n}, (\mathbf{n}, \mathbf{n} \backslash \mathbf{s}/\mathbf{n}, (\mathbf{n} \hookrightarrow \mathbf{n}) \hookrightarrow (\mathbf{n} \hookrightarrow \mathbf{n}))\} \Rightarrow \mathbf{s}}{\scriptstyle[\hookrightarrow L+IM+IP]}}{\mathbf{n}, \mathbf{n} \backslash \mathbf{s}/\mathbf{n}, (\mathbf{n} \hookrightarrow \mathbf{n}) \hookrightarrow (\mathbf{n} \hookrightarrow \mathbf{n}) \Rightarrow (\mathbf{n} \hookrightarrow \mathbf{n}) \hookrightarrow \mathbf{s}}{\scriptstyle[\hookrightarrow R]}}{\mathbf{n}, \mathbf{n} \backslash \mathbf{s}/\mathbf{n}, \mathbf{n} \hookrightarrow \mathbf{n} \Rightarrow (\mathbf{n} \hookrightarrow \mathbf{n}) \hookrightarrow \mathbf{s}}{\scriptstyle[Cut]}$$

Figure 2: Partial Derivation of *Bill spent his money, and John saved it* in the sloppy reading.

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(34) $B/A \Rightarrow A \hookrightarrow B$

However, adding this to **LA** as it is would lead to heavy over-generation, allowing for unrestricted deletion of substrings if preceded by an identical substring. It is inevitable to restrict (34) appropriately, thereby taking the interaction of ellipsis with intonation and focus into consideration.

Nothing has been said so far about the model theory of **LA**. It is no more than a technical exercise to identify a class of multi-modal ordered groupoids such that **LA** is sound and complete, but this would make the prosodic structures very abstract and make them resemble GB's S-structures more than surface structures. This is against the surface-oriented creed of Categorial Grammar. Therefore it is desirable to have a model theory where prosodic algebras are just sets of strings with concatenation as the only operation, and to assign the burden of the second mode of combination to the semantic algebra instead.

Finally, it should be checked to what degree the insights of Dynamic Semantics can be incorporated into the present approach. Such an attempt is promising both from a technical and an empirical point of view. Since both Dynamic Logic and substructural logics describe cognitive actions rather than states, natural connections are likely to exist. Nevertheless, the area is largely unexplored (but see van Benthem 1991,Oehrle 1997). Empirically, such a "dynamic turn" seems inevitable anyway, in order to handle discourse ellipsis as for instance in question-answer sequences.

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Amount Quantification, Referentiality, and Long *Wh*-Movement[*]

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1. Introduction

Rizzi (1989), developing a proposal first made in Rizzi (1988) and incorporating an important modification from Cinque (1989) (see also Aoun (1986) for a related discussion), argues that whether *wh*-expressions can undergo so-called "long" movement depends on whether they are referential or function only as operators. He claims that non-referential *wh*-phrases lack a referential index and so leave unindexed traces when they move. These unindexed traces, to be linked to the moved phrase associated with them, must be governed by a local antecedent. The indexed traces left by the movement of a referential *wh*-phrase, on the other hand, do not require antecedent government because they are bound by (coindexed with) their antecedent. The difference between the two classes of phrase is predicted to show up in movement out of *wh*-islands ("long movement"). Since the filled intermediate COMP in these cases blocks antecedent government, the movement of non-referential *wh*-phrases should be impossible. Movement of referential *wh*-phrases, on the other hand, should be relatively acceptable, though degraded slightly by the subjacency effect.

The distinction between referential and non-referential *wh*-phrases overlaps the complement/adjunct distinction and is meant to supersede it (see Epstein (1987) for another attempt to reduce the complement/adjunct distinction to indexing differences). Thus, the well-known asymmetry between cases like (1) and (2) is to be a consequence, not of the fact that adjuncts are not theta governed (see Chomsky 1986), but rather of the fact that they are not referential:

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[*] This paper is a substantially revised version of one presented to the Conference on Cross-Linguistic Quantification held in July 1989 as part of the Linguistic Society of American Summer Institute at the University of Arizona. In writing it, I have benefited from discussions with a number of people, including Sylvain Bromberger, Sam Epstein, Nomi Erteshik, Jack Hoeksema, Tina Kraskow, Elaine McNulty, Beatrice Santorini, and Raffaella Zanuttini.

Note from the Editors: This paper was written in 1989 but not published until now. We include it here in order to make this widely cited work more easily available. It has not been updated and so lacks all reference to recent work on the topic.

(1) Which problem were you wondering whether to tackle?
(2) *How were you wondering which problem to tackle?

Rizzi's motivation for stating the constraint on long movement in terms of referentiality instead of theta government is that some verbal complements that are clearly theta governed nonetheless resist long movement. These complements are of two types: idiomatic and amount quantified objects. The idiomatic cases, however, are problematic for a number of reasons,[1] leaving the amount quantified objects as the clearest instances of the phenomenon Rizzi describes. The resistance of *wh*-amount quantifiers to long movement from theta-governed positions is shown by the contrast between (3) or (4) and (5):[2]

(3) a. How much did the book cost?
b. How much did Bill pay for the book?
(4) a. How much did Bill say that the book cost?
b. How much did Bill decide to pay for the book?
(5) a. *How much did Bill wonder whether the book cost?
b. *How much did Bill wonder whether to pay for the book?

In all of these sentences the phrase *how much* is the complement of a verb. In the (a) sentences it is a measure phrase complement and in the (b) sentences it is a simple direct object. Nonetheless, the long movement in (5) is unacceptable. Since government and theta role assignment obtain here, it seems reasonable to suppose that the nature of the moved *wh*-phrase is responsible for the deviance in (5). What is wrong, according to Rizzi, is that the *wh*-amount quantifier is not referential.

This approach to understanding the ill-formedness of (5) seems promising to us, and in the discussion that follows we will try to understand better in what the referentiality requirement might consist. Our investigation, however, will lead to conclusions somewhat different from Rizzi's. In the first place, it is easy to show, as Rizzi himself recognizes, that a simple referentiality requirement will not account for the general failure of adjuncts to extract by long movement. Therefore, at least at our current level of understanding of the phenomena, we must continue to block the extraction of adjuncts per se. Secondly, we can show that the referentiality requirement is a semantic and pragmatic one; therefore, it need not and should not be invoked to constrain extraction syntactically. Rather, certain questions, in particular cases like (5), are unacceptable because their presuppositions are highly implausible. As expected, when contexts are constructed in which the plausibility of these presuppositions is increased, the questions become acceptable. If this view of the referentiality requirement is correct, then the extraction of complements remains syntactically free, as has been generally assumed. Here again, it seems that the referentiality effects described by Rizzi do not provide grounds for ceasing to take the complement/adjunct asymmetry as fundamental to the syntax of *wh*-extraction. Such a conclusion would only be warranted, in our view, if it were possible to show that all constraints on adjunct extraction were explicable in semantic and pragmatic terms. This possibility is worth further investigation, but it is far from certain to be correct.[3] In any case, such a conclusion would be just the reverse of the one reached by Rizzi, whose analysis constrains extraction more tightly in the syntax than previous work, since it rules out not only adjunct extractions but also some extractions of complements.

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[1] These reasons include the fact that it is unclear whether idiomatic objects are theta governed and the fact that even short movement of idiomatic objects is often unacceptable. For these reasons we have chosen to limit our discussion to the amount quantifier case, where the facts and their interpretation seem clearer.

[2] Rizzi's discussion is based on Italian examples, but the facts in English seem to be exactly parallel.

2. The Nature of Referentiality

In defining a notion of referentiality relevant to his concerns, Rizzi appeals to the discussion in Cinque (1989). The latter proposes that referential *wh*-phrases are those which are d(iscourse)-linked, in the sense of Pesetsky (1987). Under Cinque's interpretation, d-linked *wh*-phrases refer to members of a set that has been evoked in the discourse (see Prince 1981), while non-d-linked *wh*-phrases, being operators, make no such reference. Since amount quantifiers like *how much* will rarely or never be d-linked, they will not be referential and will not license long movement. Amount quantifiers pattern with bare *wh* words, which are ordinarily non d-linked, while expressions of the form

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[3] One piece of evidence that supports the removal of the complement/adjunct asymmetry from the syntax is the following contrast:

(i) a. *How quickly were you wondering whether anybody could run?
b. *Quickly, I wonder whether anybody could run.
(ii) That quickly, I wonder whether anybody could run.

In (ii) the topicalized element is clearly referential and the contrast with (ib) gives evidence that this referentiality is responsible for the acceptability of the long movement. This pattern does not extend to at least some other adjuncts (see 8 below); and unless these cases can be given a semantic analysis, the complement/adjunct distinction will not be dispensible.

which+N are d-linked. Thus, consider (6) below:

(6) A man walks into an apartment building in front of two women who are conversing on the sidewalk. One says to the other: "Who/Which man just went into the building?"

If the speaker in (6) uses *who,* she indicates no expectation as to the identity of the person who entered the building. If, on the other hand, the speaker uses the phrase *which man,* she is assuming not only that the person is a man but also that he belongs to some contextually defined set salient in her interlocutor's consciousness. Therefore, in the second case, the NP expected as an answer to the question refers to an (as yet) unidentified member of that set. By taking d-linking to be equivalent to referentiality, Cinque obtains an explanation for contrasts like that between (7a) and (7b) below:

(7) a. ??What were you wondering how to fix e?
    b. Which car were you wondering how to fix e?

Example (7a) sounds odd because *what* is ordinarily non-d-linked and so non-referential. It lacks a referential index and, when it moves, leaves behind an unindexed trace. This trace, therefore, must be licensed (i.e., identified) by antecedent government; but the needed trace in COMP is absent since its position is filled by *how.* (If, following Chomsky 1986, we assume movement via adjunction to VP, then the VP-adjoined trace is the offending one.) In (7b), the *wh*-phrase *which car* is d-linked and referential so that the moved *wh* and its trace are coindexed. This coindexing serves to identify the trace, making antecedent government unnecessary. This example illustrates why Rizzi (1989) adopts Cinque's definition of referentiality in preference to his own 1988 definition, which does not account for the contrast in (7). The earlier paper distinguishes referential from non-referential NP's by their theta role, stipulating that all and only NP's receiving the theta roles of participants in the event-type denoted by a verb count as referential. Under this definition the extracted element is equally referential in both of the sentences of (7); and so both extractions should be acceptable, aside from the subjacency effect, which must be abstracted away from in comparing long movement cases.

Cinque's concept of referentiality is certainly more plausible than Rizzi's original one. It seems based on a real semantic property of noun phrases with observable effects on meaning and discourse structure, while Rizzi's notion does not have any obvious linguistic reality other than its role in constraining extraction. Unfortunately, as Rizzi points out, Cinque's notion does not account for the whole range of complement/adjunct extraction asymmetries.

Consider, for example, the contrast in (8) [our English equivalent of example (36) in Rizzi (1989)]:[4]

(8) a. *For which reason don't you know if we can say [that Gianni was fired e]?
b. Which reason don't you know if we can give e for Gianni's firing?

The questioned elements in these two sentences are equally referential yet there is a sharp contrast in their acceptability. The fact is that reason adverbs can never be extracted from *wh*-islands; and this phenomenon is not obviously a result of their referential status. To account for this case Rizzi proposes to keep his referential theta role requirement on extraction as a supplement to Cinque's referentiality requirement. But since Cinque's requirement covers all variation in the acceptability of long movement out of argument positions, the only effect of Rizzi's theta role requirement is to capture argument/adjunct asymmetries like (8). In other words, the contrast in (8) shows that an argument/adjunct asymmetry in long movement remains, which is not due to referentiality effects. As we mentioned earlier, this remaining asymmetry may have another semantic or pragmatic explanation or it may be syntactic, as up to now it has seemed to be. In either case, the use of a referentiality requirement to constrain long movement does not allow one to dispense with the distinction between complements and adjuncts.

In associating referentiality with d-linking, Cinque raises for us, though he does not himself discuss it, the question of exactly what semantic property is controlling acceptability differences like those in (7). According to Pesetsky, a d-linked *wh*-phrase is one whose use in a question limits the range of felicitous answers to the members of a contextually defined set; and it is reasonable to suppose that non-d-linked expressions make no reference to contextually defined sets. However, it is not obvious that non-d-linked expressions are in any semantic or pragmatic sense "non-referential". Their use does constrain answers to membership in fixed sets. The sets are only rigidly (i.e., semantically), and very broadly, rather than contextually, and more narrowly, defined.

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[4] The obvious hypothesis that the contrast in (8) is due to the fronting of a PP versus an NP is incorrect. Compare the sentences below:

(i) a. Which child were you wondering whether to give books to?
b. To which child were you wondering whether to give books?

Here there is a slight asymmetry, probably due to the fact that preposition stranding is generally more natural than pied-piping in English. The difference, however, is not comparable to the sharp contrast in (8).

Thus, in (9a) below, expected answers are constrained to belong to the set of human beings while in (9b) the answer is expected to be a non-human entity:

(9) a. Who fell?
b. What fell?

In the end, we will argue that *wh*-expressions in matrix questions[5] are always "referential" in some sense and that Cinque's non-referential examples have another analysis than the one he proposes. Nonetheless, the dichotomy he sets up is revealing and we will continue to use the terms "referential" and "non-referential" as convenient labels for the two cases Cinque has isolated.

3. Amount Quantifier Movement Out of *Wh*-Islands

Cinque notes in passing that amount quantifier *wh*-expressions are ambiguous and that this ambiguity affects whether they can undergo long movement. Given his perspective, he assumes that the two interpretations of these expressions differ simply in referentiality. The ambiguity is worth further examination, however, which will reveal semantic complexities that Cinque does not discuss. Consider the following case:

(10) How many books did the editor publish this year?

This example looks superficially like (3), but the relative acceptability of the long movement in (11) as compared to (5) shows that there is an important difference:

(11) a. How many books did Bill wonder whether the editor would publish this year?
b. How many books did the editor wonder whether to publish this year?

The sentences of (11) are acceptable and the questioned amount quantifier phrase does seem to refer to a set of books. This becomes clear if we compare (11) to (12):

(12) a. How many books did Bill say that the editor would publish this year?
b. How many books did the editor decide to publish this year?

The sentences in (12) are ambiguous as to the apparent scope of the amount quantifier in a way that those in (11) are not; and the missing readings in (11), as expected, are the ones where the amount quantified *wh*-phrase is being taken non-referentially.[6]

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[5] We are limiting our attention here to non-multiple *wh*-questions.

If the contrast between (11) and (12) is due to a difference in the referentiality of the *wh*-phrase, then we can expect to understand better the character of this difference by closer semantic and pragmatic analysis. In particular, we might consider the relationship between *wh*-phrase referentiality and the existential presuppositions of questions (see Comorovski 1988). Every *wh*-question presupposes an existential sentence. Thus, a simple question like (13) presupposes (14):

(13) Who left?
(14) Someone left.

This presupposition does not in any direct way constrain possible answers to the question; for example, it is perfectly possible in this case to answer "No one." Rather the presupposition is a requirement on the "askability" of a question. The speaker, in asking the question, must presuppose the corresponding existential sentence. Although the presupposition can seemingly be canceled, as in (15), the cancellation is only apparent.

(15) Who left, if anyone.

In such cases, a speaker is taken to be asking a question only when the if-clause condition is satisfied.[7] Thus, (15) as a whole does not presuppose that someone left; but it is a question only if the existential presupposition holds.

One property of the existential presuppositions of questions is that they introduce discourse referents just in the way that declarative sentences with wide scope existentially quantified NP's do. Thus, to (13) the speaker can add (16):

(16) Whoever he is better have had a good reason.

The definite pronoun *he* in (16) refers to a uniquely identifiable discourse entity in the same way when used after (13) as when used after a simple existential sentence, say (14). Thus, even in the absence of an answer to the question that identifies a leaver, the speaker of (13) (or his/her interlocutor) has introduced a discourse entity. Furthermore, in the subsequent discourse that entity is uniquely identifiable (within the given context, of course; see Hawkins 1978, Prince 1981 for analyses of this identifiability) since it can be referred to by a definite pronoun. Since the uttering of (13) gives no information about the new discourse entity except that it has the property of having left, we must say that this property is sufficient by itself to identify the entity uniquely in the context in which the question is used. This point will become crucial in the discussion to follow.

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[6] Under Cinque's analysis this pattern is expected but not under Rizzi's original treatment. Obviously, the theta role of the moved *wh*-phrase does not vary between (11) and (12).

[7] This semantic point is mirrored in the intonation of our example. The question intonation occurs over the phrase *who left* with the conditional receiving declarative intonation.

Consider the existential presuppositions of amount quantified questions. The sentence in (17) gives informally the presupposition of the non-referential (3a) and the sentences in (18) give the presuppositions of (10) on its non-referential and referential readings, respectively:[8]

(17) There is an amount of money such that the book cost that amount.
(18) a. There is an amount of books such that the editor published that amount this year.
b. There is a set of books such that the editor published that set this year.

Given these presuppositions, the questions ask for an identification of the measure of the entities introduced by the existential quantification. The measure of a set of countable objects is, of course, its cardinality; and the measure of a mass entity is an amount, expressed in units appropriate for measuring that sort of entity. Acceptable instances of long-moved amount quantifiers have presuppositions parallel to (18b). Thus, in (19a) we have a sentence structurally parallel to the acceptable (11) and (19b) gives its existential presupposition:

(19) a. How many books did Bill ask whether the company was interested in publishing?
b. There was a set of books for which Bill asked whether the company was interested in publishing them.

If we construct the existential presupposition for a long moved non-referential amount quantifier, as in (20a), in the same way as for the above examples, we obtain something like (20b):

(20) a. *How much money was John wondering whether to pay?
b. There was a sum of money about which John was wondering whether to pay it.

This presupposition is semantically well-formed but odd; that is, the sentence is unusable under most discourse circumstances, which suggests that (20a) is perhaps not ungrammatical but merely unusable in most contexts. The oddness of the presupposition lies in its stating that there could be a specific sum of money, say twenty dollars, that could be uniquely identified in the discourse by having the property that John was wondering whether to pay it. Of course, John might plausibly wonder how much to pay, but then there is no unique sum with the property that he is wondering whether to pay *it*. As one might expect, under carefully chosen circumstances, the equivalent of (20b) can be made more plausible as a presupposition and then the equivalent of (20a) seems acceptable. Consider (21a) below with the presupposition in (21b) in the context of a sports tournament of some type:

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[8] We are treating the two meanings of amount quantifiers over countable sets as though they were unrelated. This seems unlikely; but further work would be needed to determine whether one can be derived from the other.

(21) a. How many points are the judges arguing about whether to deduct?
b. There is a number of points about which the judges were arguing whether to deduct that number.

This question can be asked of one spectator by another under certain narrowly constrained circumstances. Suppose that the rules of the sport specify fixed point deductions for various infractions and that the judges are arguing about whether to call an infraction from a class requiring the deduction of a certain number of points. They have decided what class of infraction is involved but not whether actually to deduct the points. Then, if a spectator is interested only in the number of points to be deducted and not in the nature of the infraction, he/she might ask the question in (21a). If our judgment is correct here, then it follows that the unacceptability of long-movement of "non-referential" amount quantifiers is due, not to any semantic non-referentiality but rather to their quantifying over (hence, referring to) amounts rather than more usual sorts of entities.

In our sports example, the different numbers of points that can be deducted make up a situationally evoked (see again Prince 1981) set to which the questioned *wh*-phrase in (21a) is d-linked. Contexts which link *wh*-phrases to evoked sets favor long movement because they make the presupposition that there is a unique entity of the appropriate type more plausible by supplying a specific set of candidate entities that might satisfy the presupposition. But d-linking is not an absolute requirement for long movement and does not directly constrain it.[9] Thus, examples like the following seem relatively acceptable even in non-d-linked contexts:

(22) a. Who were you wondering whether to visit on your vacation?

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[9] Here we differ from Comorovski (1988), who gives a semantic account of extractability from wh- islands otherwise similar to our own. See also Groenendijk and Stokhof (1982).

b. What were you wondering whether to make for dinner?

On the other hand, d-linking also facilitates the asking of syntactically simple questions where movement constraints are not at issue, as the contrast between (23) and (24) shows:

(23) ? Where did you change jobs the most?
(24) In which city did you change jobs the most?

Here in (23) it is not clear what sorts of locations are possible answers so the question is a bit hard to interpret. In (24) the phrase *in which city* links up to a context in which the locations that would serve as answers have already been evoked and so the question is more felicitous.

To summarize our discussion to this point, we have presented evidence that the problem with long-movement in "non-referential" amount questions is not that the amount quantifier is non-referential but rather that it refers to an amount.[10] In such cases, a general requirement on *wh*-questions is usually not met; namely, that their existential presupposition introduce an entity uniquely identifiable in the discourse context is. Thus, a sentence like (5a), repeated here as (25a), has the presupposition in (25b):

(25) a. *How much did Bill wonder whether the book cost?
b. There is a sum such that Bill wondered whether the book cost that sum.

In other words, (25a) is synonymous with the following question:

(26) For what specific sum of money did Bill wonder whether the book cost that sum?

This paraphrase, though perfectly grammatical and not involving long movement, is pragmatically odd in the same obvious way that an answer to that question is odd:

(27) Bill wondered about the amount ten dollars whether the book cost that.

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[10] Certainly, amounts can be referential entities, as in the following sentence:

(i) The amount that I paid for the book was enough to cover two meals in a good restaurant.

It is not clear how the existence of sentences like (i) could be made compatible with the Rizzi/Cinque claim that amount quantifiers are not ordinarily referential.

Normally, one doesn't wonder about specific amounts whether some property holds of them and this fact is sufficient to account for the oddness of (25)-(27), independently of whether the examples exhibit *wh*-movement, strengthening our claim that the problem with such cases is pragmatic and semantic and that long movement of amount quantifier *wh*-phrases from complement position is not restricted in the syntax.

4. Additional Evidence

Considerable additional evidence can be adduced for the analysis presented above. The following sections discuss some of this evidence, drawing on the behavior of echo questions, the negative island effect, and scope reconstruction.

4.1. Echo Questions

With appropriate intonation, sentences containing questioned constituents can be taken as requests for information which the asker presumes to have just been introduced into a discourse but which he/she has missed. Such echo questions ordinarily use the same syntactic form as the declarative sentence that introduced the misunderstood information. In fact, they are frequently asked with the *wh* in situ, as in (28) below:

(28) The book cost *how* much?

However, it also possible, if the special intonation is retained, for the *wh* element to appear in its ordinary fronted position, as in (29):

(29) *How* much did the book cost?

In an echo question, the existence of a specific and unique discourse entity that satisfies the question's existential presupposition is always guaranteed since the question is parasitic on the preceding declarative. Therefore, one expects, in light of our discussion, that long-movement of amount quantifiers should occur freely in echo questions. The example below indicates that it does (see the discussion in Comorovski 1988):[11]

(30) A: We asked whether the book cost ten dollars.
B: a. You asked whether the book cost how much?
OR b. How much did you ask whether the book cost?

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[11] Thanks to Beatrice Santorini for drawing our attention to the echo question interpretation in long movement cases.

Of course, the circumstances under which A would utter the sentence given are quite limited since the question, "Did the book cost ten dollars?" can itself only be asked felicitously if the speaker has reason to think that ten dollars is somehow a specially appropriate price to ask about; for example, because there are reasons to think it the most likely price. However, given A's utterance, B can always ask the echo question (a) to confirm what A said; and whenever (a) is possible, so is (b).

4.2. Negative Islands

An important motivation for introducing considerations of referentiality into the description of *wh*-movement are the facts of extraction from so-called "negative islands" (Ross 1984). As Rizzi points out, these facts parallel those of long movement out of indirect questions. Thus, the negated counterparts of questions like (31), given in (32), are unacceptable:

(31) a. How much did it cost?
b. How much did you pay?
(32) a. *How much didn't it cost?
b. *How much didn't you pay?

Rizzi argues that this contrast arises because negation projects an additional phrasal boundary, NegP, which blocks antecedent government. However, this simple configurational account runs into difficulty with examples like (33):

(33) a. How much/little did you manage to pay?
b. *How much/little did you fail to pay?

Here we see that the inherently negative verb *fail* blocks movement just as an overt negative does, in contrast to the non-negative verb *manage.* In a footnote Rizzi suggests that the negative verb may raise at LF to a position that blocks antecedent government, presumably NegP, but he doesn't investigate this possibility in any detail. The plausibility of this approach is limited, given that it would seem to make a wrong prediction as to the scope of negation in sentences with the verb *fail* as opposed to those with overt sentence negation. Consider, for example, the following pairs:

(34) a. He has not always managed to pay his bills.
b. He has always failed to pay his bills.
(35) a. Everyone has not managed to pay his bills.
b. Everyone has failed to pay his bills.

In both of these cases the negation associated with *fail* has narrow scope with respect to the quantifier in the sentence while the sentence negative *not* has, obligatorily in (34) and optionally in (35), wide scope over the quantifier. If LF is the input to quantifier interpretation, then *fail* cannot raise at LF. However, *fail* does contain a negative operator able to take wide scope over a quantifier. When *fail* c-commands the quantifier from its s-structure (i.e., non-raised) position, its negation may take wide scope. Thus, the following pair of sentences are both ambiguous and the contrast between verbal and sentential negation found above having disappeared:

(36) a. He has not managed to pay all of his bills.
b. He has failed to pay all of his bills

Aside from the difficulty for the Rizzi/Cinque analysis posed by inherently negative verbs, there is also a problem posed by negative quantifiers. Thus, the unacceptable sentences in (32) are matched by sentence like those in (37) below, in which negatively quantified NP's provide the negative force:[12]

(37) a. *How much do no books cost?
b. *How much did none of you pay?

In these sentences, there would seem to be no NegP to create the barrier needed by Rizzi's account, unless somehow a negative lowering operation can be motivated at LF, an implausible option at present.

The difficulties with a syntactic account of the "negative island" effects suggest an attempt to unify them under our semantic analysis of constraints on long movement of amount quantifiers. Indeed, just as we might expect under a semantic account we find that it is possible to construct contexts where extraction from negative is allowed. Consider (38):

(38) How much didn't you pay that you were supposed to?

Here the extraposed relative clause modifying *how much* serves to introduce a unique amount into the existential presupposition of the question, which might be stated as in (39):

(39) There was a sum that you were supposed to pay that you didn't pay.

Since this presupposition is plausible, the question is acceptable. Another example that makes the same point is the discourse in (40), where the extraction sounds perfectly fine in the ironic context:[13]

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[12] There is, of course, a secondary reading of these sentences with a constituent negation interpretation. On this reading the sentences are acceptable but then not relevant to the negative island effect.

[13] Thanks to Jack Hoeksema for this example.

(40) A:How much have beans been costing lately?
B:The price has been jumping around so much, you'd do better to ask:
How much haven't they cost?

From such examples and others easily constructed, we may conclude that the same semantic account based on the plausibility of presuppositions covers extraction out of both *wh*-islands and negative contexts. Thus, further investigation supports the generalization across these two cases proposed by Rizzi, although not his specific analysis.

4.3. Scope Reconstruction

One piece of evidence adduced by Cinque in support of his use of referentiality to constrain long movement is a restriction on scope interpretation observed in Longobardi (1987). Longobardi notes a difference in the scope of the *wh* operator and the universal quantifier in sentences like the following pair:[14]

(41) How many patients do you think that every doctor in the hospital can visit in an hour?
(42) ? How many patients did you wonder whether every doctor in the hospital could visit in an hour?

Example (42) is odd because of the long moved amount quantifier but it can only be interpreted with *every* having narrow scope with respect to *how many.* Example (41), on the other hand, is ambiguous as to the scope of *every* and *how many.* Following Longobardi, Cinque attributes the ambiguity of (41) to the optional reconstruction of the moved *wh*-phrase back to its deep structure position. To explain the absence of ambiguity in (42), Longobardi points to the lack of an intermediate trace in the COMP of its embedded clause and argues that scope reconstruction requires a chain of local (antecedent governed) traces. Cinque rejects this account because other reconstruction effects, those involving pronoun binding, do not require such a chain. Thus, the sentences in (43) [Cinque's (29)] show that a *wh*-island does not block reconstruction with respect to the application of principles A, B, or C of the binding theory:

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[14] Longobardi's examples are in Italian; but the facts of English correspond reasonably closely to the Italian ones so that we will base our discussion on English examples. There is a difference between the languages that we will ignore in our discussion but that merits further investigation. The English example (41) is ambiguous and at least some speakers prefer the reading under which *every doctor in the hospital* has narrow scope with respect to *how many patients.* The Italian example apparently has as its preferred reading the one with wide scope for the universally quantified NP.

(43) a. It's of herself that I don't know whether she thinks.
b. *It's of her(i) that I don't know whether Mary(i) thinks.
c. *It's of Mary(i) that I don't know whether she(i) thinks.

Given this pattern, Cinque proposes that the failure of reconstruction in (42) is due to the fact that *how many patients* is necessarily referential, having been long-moved out of a *wh*-island, and being referential, cannot occur inside the scope of a quantifier.

There are two considerations which militate against Cinque's analysis here. First of all, it is not true that long-moved *wh*-phrases cannot interact with quantifiers. Cinque apparently expects a lack of interaction because referential noun phrases (definite noun phrases and specific indefinites) ordinarily do not interact with quantifiers. On our analysis every *wh*-question phrase is associated with an existential quantifier and so has the potential to exhibit scope ambiguity. Such ambiguity is quite clearly possible; consider, for instance, the following case:

(44) a. The boss wants to know which projects every other firm still has not decided whether to bid on.
b. The boss wants lists of which projects every other firm still has not decided whether to bid on.

These sentences are ambiguous as to the relative scope of *which projects* and *every other firm*; indeed, the reading on which *every other firm* has wide scope seems the preferred one. However, on Cinque's analysis this reading should be impossible since *which project* has been long-moved and is referential. Either referentiality does not block interaction with quantifiers, in which case Longobardi's scope reconstruction effect is not explained, or, contra Cinque's central proposal, it is not a condition on long movement. Secondly, there seems to be less reason than Cinque indicates to expect scope reconstruction to pattern with reconstruction effects involving pronominal binding. The latter, at least in the core cases Cinque considers, seem to involve only the syntactic configurations under which coindexing is checked and not to involve semantic interpretation in any deep way. The former, on the other hand, occurs only in semantically intensional contexts, interacts with quantifier raising, and depends for its analysis on exactly how one interprets the quantificational character of questioned constituents. An exploration of this phenomenon is beyond the scope of this paper; but in the absence of a precise proposal regarding the semantics of scope reconstruction, there is little reason for surprise its not falling together with the binding cases.

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Valency in Kannada: Evidence for Interpretive Morphology

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1. Introduction[1]

Standard conceptions of the lexicon-syntax interface assume that morphologically complex words are constructed in the lexicon and then serve as the atomic objects for syntactic computation. On this view, morphologically complex words are the terminal nodes in a syntactic phrase-marker, their internal structure invisible to syntactic operations. The argument-taking properties of words can be altered by rules which apply inside the lexicon, often with a concomitant morphophonological change, but these properties cannot be affected by syntactic operations. In this paper, I explore an alternative grammatical architecture in which morphology applies to the output of the syntactic component (cf. Halle and Marantz 1993; Marantz 1997). Morphologically complex words, on this view, reflect properties of syntactic structure, which includes argument-structure information.

The argument proceeds from an examination of Kannada 'valency-changing' morphology, revealing that lexical properties alone cannot explain the distribution of the reflexive and causative morphemes. Moreover, given certain independently motivated assumptions about the representation of anaphora, Kannada reflexive morphology provides an argument that the morphological component takes LF representations as input and hence that morphological structure is an interpretation of syntactic structure, not the input to it. The resultant theory is one in which the morphological component determines how a given LF representation should be pronounced. Simply put, LF equals PF. The level of representation that serves as the input to

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semantics is the same level of representation that serves as the input to morphophonology. The so-called reflexive morpheme argues strongly for a morphological component which is postsyntactic because it is only at LF that the environment for the insertion of this morpheme is met. A theory in which morphologically complex words are constructed prior to syntax or even during the syntactic derivation cannot explain the distribution of this morpheme. Thus, we need a grammatical architecture in which morphology applies to the output of a syntactic derivation.

2. Jerry Fodor Meets Panini

Examination of change of state (COS) verbs in Kannada reveals a complementarity between lexical and morphological causativity. If a COS verb occurs with causative morphology in its transitive use, then it does not have a morphologically unmarked transitive use:[2]

1) a. barf-u karg-i-tu
ice-NOM melt-PST-3SN
'the ice melted.'
b. * surya barf-annu karg-i-tu
sun ice-ACC melt-PST-3SN
'the sun melted the ice.'
c. surya barf-annu karag-is-i-tu
sun ice-ACC melt-CAUS-PST-3SN
'the sun melted the ice.'
2) a. neer kud-i-tu
water boil-PST-3SN
'the water boiled.'
b. * naan-u neer-annu kud-id-e
I-NOM water-ACC boil-PST-1S
'I boiled the water.'

---

[2] All Kannada data was collected between 1994 and 1997. The following abbreviations are used in the glosses: 1 =1st person, 2 =2nd person, 3 =3rd person, ACC = Accusative, CAUS = Causative, DAT = Dative, F = Feminine, INSTR = Instrumental, M = Masculine, N = Neuter, NOM = Nominative, NPST = Nonpast, PL = Plural, PP = Participle, PRED = Predicate, PST = Past, REFL = Reflexive, S = Singular. Capital letters in the transcription represent retroflex consonants. The transcription scheme is that of Sridhar 1990.

c. naan-u neer-annu kud-is-id-e
I-NOM water-ACC boil-CAUS-PST-1S
'I boiled the water.'

3) a. kaar-u tukk-i-tu
car-NOM rust-PST-3SN
'the car rusted.'

b. * maLey-u karr-annu tukk-i-tu
rain-NOM car-ACC rust-PST-3SN
'the rain rusted the car.'

c. maLey-u karr-annu tukk-is-i-tu
rain-NOM car-ACC rust-CAUS-PST-3SN
'the rain rusted the car.'

4) a. hoov-u udur-i-tu
flower-NOM wilt-PST-3SN
'the flower wilted.'

b. * gaaliy-u hoov-annu udur-i-tu
wind-NOM flower-ACC wilt-PST-3SN
'the wind wilted the flower.'

c. gaaliy-u hoov-annu udur-is-i-tu
wind-NOM flower-ACC wilt-CAUS-PST-3SN
'the wind wilted the flower.'

Conversely, if a COS verb has a morphologically unmarked transitive use, it does not have a morphological causative with only two arguments.[3]

5) a. baagil-u tere-d-itu
door-NOM open-PST-3SN
'the door opened.'

b. gaaliy-u baagil-annu tere-d-itu
wind-NOM door-ACC open-PST-3SN
'the wind opened the door.'

c. * gaaliy-u baagil-annu terey-is-i-tu
wind-NOM door-ACC open-CAUS-PST-3SN
'the wind opened the door.'

---

[3] I should note that the (c) cases in (5-8) represent grammatical strings. What is ruled out in these cases is an interpretation with only two arguments. The grammatical interpretation of the (c) cases would have a null pronoun as one of the arguments and hence an interpretation like "I made someone verb..."

d. gaaliyu rashmiy-inda baagl-annu terey-is-i-tu
wind-NOM Rashmi-INSTR door-ACC open-CAUS-PST-3SN
'the wind made Rashmi open the door.'

6) a. baagil-u much-i-tu
door-NOM close-PST-3SN
'the door closed.'

b. gaaliy-u baagil-annu much-i-tu
wind-NOM door-ACC close-PST-3SN
'the wind closed the door.'

c. * gaaliyu baagil-annu much-is-i-tu
wind-NOM door-ACC close-CAUS-PST-3SN
'the wind closed the door.'

d. gaaliyu rashmiy-inda baagil-annu much-is-i-tu
wind-NOM Rashmi-INSTR door-ACC open-CAUS-PST-3SN
'the wind made Rashmi close the door.'

7) a. vataga wad-i-tu
glass break-PST-3SN
'the glass broke.'

b. naan-u vatag-annu wada-d-e
I-NOM glass-ACC break-PST-1S
'I broke the glass.'

c. * naan-u vatag-annu wad-is-id-e
I-NOM glass-ACC break-CAUS-PST-1S
'I broke the glass.'

d. naan-u rashmi-yinda vatag-annu wad-is-id-e
I-NOM Rashmi-INSTR glass-ACC break-CAUS-PST-1S
'I made Rashmi break the glass.'

8) a. hoov-u bele-d-itu
flower-NOM grow-PST-3SN
'the flower grew.'

b. naan-u hoov-annu bele-d-e
I-NOM flower-ACC grow-PST-1S
'I grew the flower.'

c. * naan-u hoov-annu bel-is-id-e
I-NOM flower-ACC grow-CAUS-PST-1S
'I grew the flower.'

d. naan-u rashmi-yinda hoovannu bel-is-id-e
I-NOM Rashmi-INSTR flower-ACC grow-CAUS-PST-1S
'I made Rashmi grow the flower.'

I will temporarily refer to the verbs in (1-4) as lexically non-causative and the verbs in (5-8) as lexically causative.

Note that there is no problem with causativizing the intransitive variant of the lexically causative verbs periphrastically, indicating that the problem with the (c) cases in (5-8) is not semantic in nature:

9) a. gaaLiy-u baagil-annu tere-vante maad-i-tu
wind-NOM door-ACC open-PRED do-PST-3SN
'the wind made the door open.'
b. gaaLiy-u baagil-annu muchi-vante maad-i-tu
wind-NOM door-ACC close-PRED do-PST-3SN
'the wind made the door close.'
c. naan-u vatag-annu wadu-vante maad-id-e
I-NOM glass-ACC break-PRED do-PST-1S
'I made the glass break.'
d. naan-u hoov-annu belu-vante maad-id-e
I-NOM flower-ACC grow-PRED do-PST-1S
'I made the flower grow.'

A lexical analysis of the complementarity between lexical and morphological causativization would take the following line of argumentation. The lexically causative verbs are underlyingly transitive while the lexically non-causative verbs are underlyingly intransitive. Adding the causative morpheme to a transitive root creates a ditransitive verb while adding it to an intransitive root creates a transitive verb. Such a solution is problematic, however, because the lexically causative verbs also have an intransitive use. There is nothing in such an analysis to prevent adding the causative morpheme to the intransitive variant of the underlyingly transitive roots. These facts do have a straightforward explanation in the Elsewhere Condition (Panini's Theorem; Kiparsky 1973), however. While all COS verbs alternate between a transitive and an intransitive use, some are marked as lexically causative. The lexical expression of causativity takes precedence over the rule-driven morphological expression. Verbs like 'open' are optionally 'cause-open' in the lexicon and so the morphological expression of causativity is blocked by the more specific lexical form. We defer formal analysis of these facts until section 4.

3. Against a Lexical Analysis

A curious property of COS verbs, from the perspective of the previous section, is that both the lexically causative and the lexically non-causative verbs have an anticausative use, marked by the verbal reflexive morpheme:

10) a. baagil-u tere-du-koND-itu
door-NOM open-PP-REFL.PST-3SN
'the door opened.'
b. baagil-u much-i-koND-itu
door-NOM close-PP-REFL.PST-3SN
'the door closed.'
c. vata wad-a-koND-itu
glass break-PP-REFL.PST-3SN
'the glass broke.'
d. hoov-u bel-a-koND-itu
flower-NOM grow-PP-REFL.PST-3SN
'the flower grew.'

11) a. barf-u karag-i-koND-itu
ice-NOM melt-PP-REFL.PST-3SN
'the ice melted.'
b. neer kud-i-koND-itu
water boil-PP-REFL.PST-3SN
'the water boiled.'
c. karr-u tukk-i-koND-itu
car-NOM rust-PP-REFL.PST-3SN
'the car rusted.'
d. hoov-u udur-i-koND-itu
flower-NOM wilt-PP-REFL.PST-3SN
'the flower wilted.'

These differ from the bare intransitives in allowing dative-marked causal adjuncts:

12) a. gaal-ige baagil-u tere-du-koND-itu
wind-DAT door-NOM open-PP-REFL.PST-3SN
'Because of the wind, the door opened.'
b. gaal-ige hoov-u udur-i-koND-itu
wind-DAT flower-NOM wilt-PP-REFL.PST-3SN
'Because of the wind, the flower wilted.'

13) a. * gaal-ige baagil-u terey-i-tu
wind-DAT door-NOM open-PST-3SN
b. * gaal-ige hoov-u udur-i-tu
wind-DAT flower-NOM wilt-PST-3SN

The facts in (12-13) suggest that the presence of the anticausative/reflexive morpheme indicates the simultaneous presence and absence of a causer, that is, the presence of a causer which is not syntactically realized by an argument NP. When the causer is expressed in an adjunct marked with dative case, the reflexive morpheme is obligatory. The reflexive morpheme cannot occur if the causer is expressed in subject position, i.e., with nominative case, however:

14) *gaali-yu hoov-annu udur-i-koND-itu
wind-NOM flower-ACC wilt-PP-REFL.PST-3SN

Thus, the presence of the verbal reflexive on COS verbs indicates that the causer is excluded from subject position, although this role is present and can be identified by an adjunct (Lidz 1996).

We might explain the fact that the lexically causative COS verbs have an anticausative use by saying that the verbal reflexive 'absorbs' the external theta-role. However, there are two reasons to think that such an analysis is on the wrong track. First, if the external theta-role is absorbed by the verbal reflexive, then we are left with the question of why the verbal reflexive is not required on all intransitive uses of lexically causative verbs. In order to follow the absorption analysis, we will need two accounts of argument absorption, one for the bare intranstives and another for the reflexive-marked intransitives. Second, the fact that the lexically non-causative verbs also have an anticausative use demonstrates that the presence of the verbal reflexive does not depend on the lexical representation of the verb. If it is true that the lexically non-causative verbs are underlyingly monadic (as demonstrated above), then there is no argument for the verbal reflexive to have absorbed in (11).

The puzzle we are left with is that the 'valency-altering' properties of the verbal reflexive are not sensitive to the lexical properties of the verb to which it attaches. When it attaches to an underlyingly transitive verb, it suppresses the external role, but when it attaches to an underlyingly intransitive verb, it adds a 'suppressed' role, i.e., a role that is entailed by the sentence but which cannot be realized by an argument NP. To give the verbal reflexive a uniform function, we might say that it only attaches to intransitive roots, always adding a suppressed role. On this view, the lexically causative verbs have two entries, one transitive and one intransitive, and the verbal reflexive only attaches to the intransitive variant. But if the verbal reflexive has access to the intransitive entry of such verbs, we should expect the causative to have access to this entry as well. A lexical analysis of the valency altering morphology of Kannada leads to a paradox: we need the intransitive entry of a lexically causative verb to be available to reflexive morphology but not to causative morphology.

4. A Solution

The solution to this problem must have two properties. It must explain the complementarity between lexical and morphological causatives and it must explain the fact that anticausative morphology is not dependent on lexical causativity.

4.1. vP

I will assume without argument that causativity/transitivity is syntactically represented as a 'causative' light verb (Chomsky 1995; Hale and Keyser 1993; Johnson 1991; Kratzer 1994 inter alia; cf. McCawley 1968).[4] Lexical roots are unaccusative; external arguments are licensed by the causative light-verb.[5]

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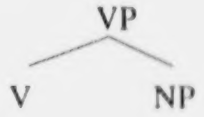
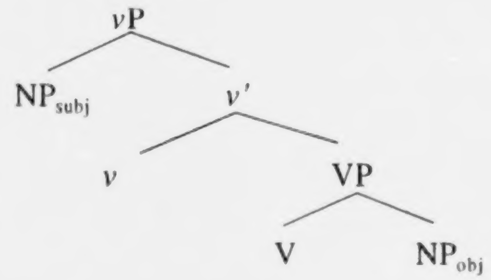
[4] The representation of causativity here differs from that of McCawley 1968 in being only a single event. That is, the generative semantics proposal was one in which there was no way to distinguish a single causative event from bi-eventive causation (cf. Fodor 1970). The representation also differs from that of Hale and Keyser (1993) in not distinguishing lexical syntax from surface syntax. The decomposition in Hale and Keyser's approach is inside the lexicon, while here it is in the syntactic representation. See Harley 1996 for elaboration.

[5] I follow Hale and Keyser (1993) and Chomsky (1995) in the claim that unergatives are covert transitives, though this is by no means necessary. Given this schema for licensing external arguments, it is possible that unergatives are simply Vs with no arguments of their own. Bare Phrase structure considerations lead to the covert transitive proposal as a way to distinguish unaccusatives from unergatives (given VP-internal subjects), however if external arguments are licensed by *v*, then the difference between unergatives and unaccusatives can be entirely within VP (i.e., not vP). On this view, vP would be required with unergative roots for reasons having to do with the EPP. If it were not generated, there would be nothing to check EPP features in TP. Exploration of this possibility would take

15) a. unaccusative:



b. transitive (and unergative):



The [*v* [VP]] configuration in (15b) entails a relation between two events where one is a proper subpart of the other. This is commonly referred to as 'causation'. External arguments, from this perspective, are arguments not of the main verb but of the light-verb. Because the configuration entails a complex event structure, the external argument identifies that entity which is responsible for the transition between sub-events, i.e., the agent/causer.

The idea that external arguments are not arguments of the root verb but of the light-verb is in accordance with Marantz's observation that the interpretation of an external argument often depends on the composition of the verb and the internal argument (Marantz 1984, ex.2.19):

16) a. throw a baseball
    b. throw support behind a candidate
    c. throw a boxing match
    d. throw a party
    e. throw a fit
17) a. kill a cockroach
    b. kill a conversation
    c. kill an evening watching TV
    d. kill a bottle
    e. kill an audience

Because the event denoted by *v*P includes the VP as a subevent, it follows that interpretation of the NP in [spec, *v*P] depends on properties of the VP (cf. Kratzer 1994; Marantz 1997).

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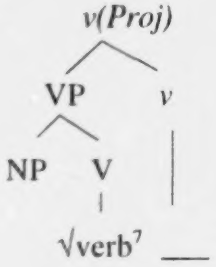
us beyond the scope of this paper, but the proposal seems reasonable at first blush.

4.2. Causative

Given the hypothesis that causation is represented in *v*P, it is natural to assume that the causative morpheme in sentences like (18) is the spell-out of *v*.[6]

18) surya barf-annu karag-is-i-tu
sun ice-ACC melt-CAUS-PST-3SN
'the sun melted the ice.'

19) *v* → [-isu-] /



This rule states that *v* is pronounced as the causative morpheme. *v*(Proj) indicates that the category formed when *v* merges with VP is *v*. In other words, the rule requires only that *v* projects. The rule does not state the level of projection of the node immediately dominating *v*; it could be *v*' or *v*P.

If (19) is the correct rule for insertion of the causative morpheme, we have to ask what blocks this rule from applying in the case of lexically causative verbs:

20) *gaaliy-u baagil-annu terey-is-i-tu
wind-NOM door-ACC open-CAUS-PST-3SN
'the wind opened the door.'

As noted above, the analysis should have the character of the Elsewhere Condition: when two rules are in competition, the more specific rule takes precedence. We need a rule which states that causative head is not pronounced in the environment of lexically causative verbs. Such a rule is given in (21):[8]

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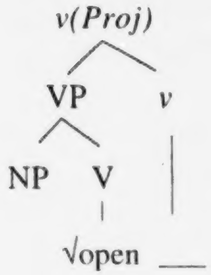
[6] Note that the trees drawn here are head-final to reflect the syntax of Kannada, though we follow Kayne (1995) and Chomsky (1995) in assuming that linear order is not represented in the syntax proper.

[7] The symbol √ is used to indicate the root form of the verb, following the notation of Pesetsky 1995.

[8] An alternative is to have a rule which states that the lexically causative verbs are pronounced unaffixed even in the context of the rule in (19). I will follow the

21) *v* → [ø] /

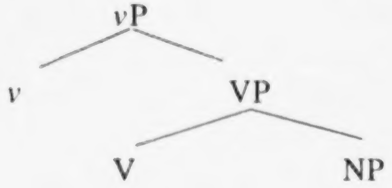


All of the so-called lexical causatives can fill the V position in this rule. These verbs are morphologically marked as not taking a causative affix in the environment of *v*. This rule is more specific than the rule in (19) because it identifies the particular class of verbs in the construction and so the application of (21) will block application of (19).

4.3. The Verbal Reflexive: Monadic Causativity

It is possible to generate a 'causative' light-verb without an NP in its specifier, giving us a configuration like (22).

22)



Because the 'causative' interpretation is due to the complex nature of the event composed of *v*-VP, we do not require an NP to realize the 'agent' theta-role in order for the entire event to be construed as causative. It is simply the relation between verbs that creates the causative role. In this sense, the 'agent' role is not actually assigned by any syntactic mechanism to the [spec, *v* P]. Rather, causation implicates a causer and an NP found in this position is free to be interpreted as such. If there is no NP in that position, as in (22), then the event is still construed as causative.

If the verbal reflexive were the morphological spell-out of *v* in (22), we would have an explanation of the interpretive properties of the anticausative COS verbs. We saw above that the anticausative verbs indicate the simultaneous presence and absence of a causer. This is precisely what is expected of

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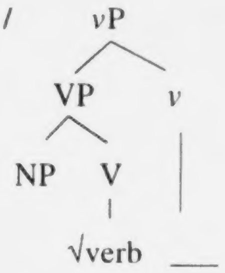
rule in the text for purposes of presentation, though nothing hinges on the precise formulation.

the structure in (22), which is causative because of its complex event structure but monadic because only one argument position is generated. In other words, anticausativity is better thought of in this context as monadic causativity. The actual cause of such an event can be identified by an adjunct, as illustrated in (12), although such an adjunct is not assigned the role of causer through any syntactic mechanism.[9]

We therefore posit the following morphological rule stating when the verbal reflexive is inserted:

23) *v* → [-koL-] /



The rule in (23) states that *v* is pronounced as the verbal reflexive just in case there is no specifier of *v*P.[10] This rule is more specific than the rule in (19) because it requires that *v* be immediately dominated by *v*P, while (19) specifies only that *v* be immediately dominated by a projection of *v*. Thus, if *v*P has no specifier, then it will be pronounced as the verbal reflexive; if it has a specifier, it will be pronounced as the causative. This rule is also more specific than the rule for lexical causatives in (21). The rule in (21) applies when a certain class of verbs are in the complement to *v*, independent of what immediately dominates *v*. Since the rule in (23) applies only if *v* is immediately dominated by *v*P it is more specific than (21) and so blocks application of (21).

Because causative and reflexive morphology are interpretive, i.e., they reflect syntactic structure rather than provide an input to it, we predict the impossibility of embedding the verbal reflexive under the causative. (24)

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[9] The analysis suggests that even the NP which occurs in [spec, vP] is not assigned its semantic role by any syntactic mechanism, but rather is interpreted in accordance with the semantic requirements of the structure. If this turns out to be true, then we will have fully severed the external argument from the verb syntactically, though certain verbs will still require an external argument for reasons having to do with Full Interpretation.

[10] Why a morpheme would be sensitive to the presence or absence of a specifier in the projection of some head is a much deeper issue than I am prepared to address at this point.

illustrates a verb which has a reflexive-marked intransitive as well as a bare intransitive. The bare instransitive can be morphologically causativized, as in (25b), but the reflexive-marked intransitive cannot, as in (25a). Both variants can be causativized periphrastically, as in (26).

24) a. raaju kuLit-i-koND-a
Raaju sit-PP-REFL.PST-3SM
'Raaju sat down.'
b. raaju kuLi-t-a
Raaju sit-PST-3SM
'Raaju sat down.'
25) a. * raajuv-annu kuliti-koLL-is-id-e
Raaju-ACC sit-REFL-CAUSE-1S
'I made raaju sit down.'
b. raajuv-annu kulit-is-id-e
Raaju-ACC sit-CAUS-PST-1S
'I made raaju sit down.'
26) a. raajuv-annu kuliti-koLL-uvante maaD-id-e
Raaju-ACC sit-REFL-PRED make-PST-1S
'I made raaju sit down.'
b. raajv-annu kuliti-vante maad-id-e
Raaju-ACC sit-PRED make-PST-1S
'I made Raaju sit down.'

An analysis in which the causative morpheme attaches to any monadic predicate will not be able to explain the inability of the reflexive to be embedded under the causative. However, in a theory in which morphology interprets syntactic structure, these facts are straightforwardly accounted for. The two morphemes are correctly predicted to be in complementary distribution in these cases because the causative morpheme and the reflexive morpheme are in competition for the same syntactic position. More precisely, these morphemes are allomorphs of the syntactic category *v* and so cannot cooccur.

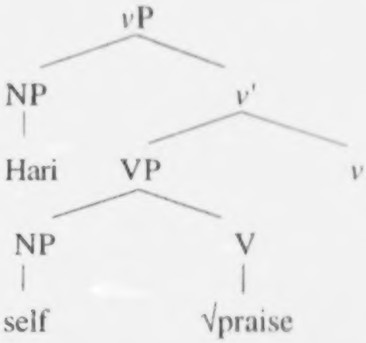
4.3.1. Monadic Causativity and Semantic Reflexivity

In the previous section we demonstrated that the verbal reflexive morpheme occurs on what we called monadic causatives, that is, in structures that are causative because of *v* but have only one argument position. This hypothesis would appear to be disconfirmed by examples like (27), in which the verbal reflexive occurs but two syntactic arguments are present, i.e., the subject and the anaphor in object position.[11]

27) hari tann-annu hogaL-i-koND-a
Hari self-ACC praise-PP-REFL.PST-3SM
'Hari praised himself.'

A sentence like (27) will have a structure like (28) when the external argument is first merged into the structure.

28)



This structure is one in which the vP has a specifier and so we expect the verbal reflexive not to occur. In this section, I will argue that the relevant structure exists at LF even if it does not exist throughout the derivation. It follows from this that the rule in (23) stating the environment for insertion of the verbal reflexive does not apply until LF. Thus, we have an argument not only for the application of morphology after some amount of syntactic structure has been built, but for the application of morphology after the entire syntactic derivation is complete.

Lidz (1997) and Lidz and Idsardi (1998) argue that whenever two NPs are semantically covalued, they must be connected in the syntax by a chain (cf. Reinhart and Reuland 1993; Reuland 1996). Two categories are semantically covalued if their reference is determined through the same entity in the discourse. We unify movement, control and anaphora under the chain relation, capturing the intuition that all of these structures involve two categories being interpreted with respect to the same entity in the model. On this view, the sentence in (27) will have a representation like (29), where the chain formed by raising the subject to [spec, IP] is fused with the chain connecting [spec, vP] with the anaphor in object position. The part of the chain connecting [spec, IP] with [spec, vP] is formed via movement, while the part connecting [spec, vP] to the object is formed via the anaphora relation.

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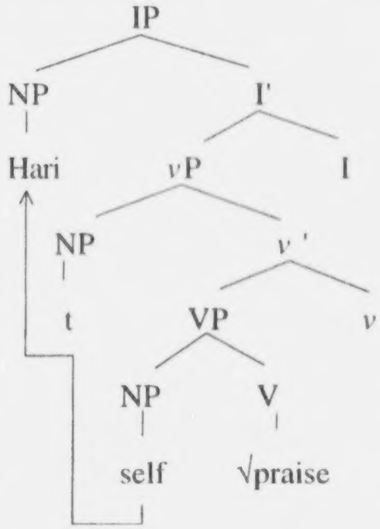
[11] This fact also argues against an analysis of the verbal reflexive in which this morpheme is the external argument incorporated into the verb, as suggested by Kayne (among others) for Romance reflexive clitics. Both the external argument and the internal argument are syntactically present as full NPs bearing case, providing evidence that no argument incorporation has occurred.

29)



I further assume that intermediate traces delete at LF (Lasnik and Saito 1992; Chomsky 1995). Chomsky (1995) argues that intermediate traces of A-movement must be invisible at LF. The conclusion is forced by cases of successive cyclic A-movement like (30). In such cases, chains are formed which do not have their case features checked.

(30) we are likely [t3 to be asked [t2 to [t1 build airplanes]]]
(31) a. CH1 = <t2, t1>
b. CH2 = <t3, t1>
c. CH3 = <we, t1>

While CH3 has its Case feature checked, CH2 and CH1 do not (assuming the traces to be copies of all of the features of the moved NP). The solution to this problem is to eliminate CH1 and CH2 entirely. Since these objects have [-interpretable] features (i.e, the case features), the heads of these chains are deleted (i.e., made invisible to the LF component). The base position, t1, cannot likewise be deleted however, since it is this position which bears the theta-role.

Similar reasoning applies to (29), with the chains in (32).

(32) a. CH1= <t, self>
b. CH2= <Hari, self>

The trace in CH1 bears the [-interpretable] nominative case feature of the subject.[12] We can therefore delete the trace, eliminating the chain CH1. This case differs from the raising case, however, in the deletion of the position to which the 'agent' theta-role is assigned. We assume that every chain must have one theta-role in order to be a legitimate object. As noted above, deletion of t1 in (30) would result in a chain with no theta-roles. In (29), however, deletion of the subject trace leaves the chain with one theta-role remaining and so deletion is possible.

Deletion of the base position of the subject entails that the subject receives the agent theta-role differently from how it would receive this role in the normal case. While this may seem problematic, it is not. We observed above that the agent theta-role is a consequence of the complex event structure entailed by the *v*-VP configuration and that this role is available for interpretation even without an NP in [spec, *v*P]. Given that the trace in [spec, *v*P] is deleted, we are left with the question of how the agent role is assigned. In particular, we can ask why (27) is not interpreted as an anticausative. The answer to this question comes from the interpretive properties of a chain with two independent lexical items in it. The chain itself entails that there is a relation between two objects, although these objects are semantically covalued. So, in order to best satisfy the interpretive properties of the chain (indicating a relation between two covalued objects with only one theta role) and the interpretive properties of the *v*-VP configuration (indicating an agentive relation) we give the agentive properties to the chain bearing the object theta role. In other words, given a convergent syntactic derivation the semantic component evaluates the output of that derivation in a way consistent with Full Interpretation. In this case, the agent properties entailed by the configuration merge with the relational properties entailed by a chain with multiple lexical items. We return to this issue in Section 4.3.2.2.

At this point we have argued that in a sentence like (27), we have a chain between the subject and object position and that the base position of the subject deletes at LF. This yields the structure (33):

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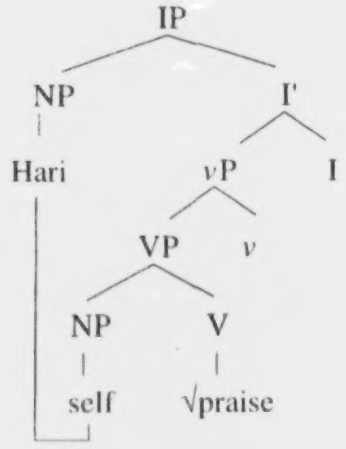
[12] I assume that the accusative case feature on the object is checked by raising it to v, without pied-piping the entire NP, along the lines of Chomsky 1995.

(33)



This structure is one in which the verbal reflexive can be inserted, although in previous stages of the derivation the environment for insertion of this morpheme was not met. Deletion of the intermediate trace in [spec, *v*P] of (29) makes this position invisible to LF. The node that was *v*' is now *v*P, assuming that maximal projection is contextually defined (Fukui and Speas 1986; Chomsky 1995) and that there is no nonbranching projection. To illustrate, let us consider the set-theoretic representation of the relevant portions of (29):

34) a. {I, {{I, {{*v*, {{*v*, {VP, *v*}}, Hari }}, I}}, Hari}} = IP
b. {*v*, {VP, *v*}} = *v*'
c. {*v*, {{*v*, {VP, *v*}}, Hari }} = *v*P

Deleting the trace of *Hari* from (29), erases the fact that *Hari* merged with *v*' in the course of the derivation. Thus, *v*' becomes *v*P. After deletion of the subject trace, we have the representation (35), where the piece of the structure that was *v*' in (34) is now *v*P, i.e., the maximal category with the label *v*:

35) a. {I, {{I, {{*v*, {VP, *v*}}, I}}, Hari }}= IP
b. {*v*, {VP, *v*}} = *v*P

Because we now have a maximal projection of *v* which does not have a specifier, the conditioning environment for insertion of the verbal reflexive is met. On the surface an example like (27) would appear to be a counterexample to the rule in (23). The S-structure representation of (27), given in (29), does not contain the environment required for (23) to apply and so we might expect the verbal reflexive not to be possible. The LF representation (33), however, does contain the structure required for (23) to apply. Given that (23) does apply, we can conclude that the LF representation provides the input to that morphological rule. (27) is therefore not a counterexample to the rule in (23) provided that this rule applies at LF. We conclude not only that lexical insertion takes place late in the derivation, but also that it takes place after the deletion of intermediate traces, i.e., at LF. We therefore have a theory in which LF is seen only as the level of syntactic representation that interfaces with the conceptual-intentional system and not as the level which reflects covert operations. In other words, there is no covert syntax in the usual sense.[13]

We demonstrated above that reflexive-marked intransitives could not be embedded under causative. The same reasoning applies if a semantically reflexive predicate is embedded under causative. We predict that such a structure will not give rise to the verbal reflexive.

(36) a. * hari raaju-vinda awannu-taane hogaL-i-koLL-is-id-a
Hari Raaju-INSTR he-ACC-self praise-PP-REFL-CAUS-PST-3SM
'Hari made Raaju praise himself.'
b. hari raaju-vinda awannu-taane hogaL-is-id-a
Hari Raaju-INSTR he-ACC-self praise-CAUSE-PST-3SM
'Hari made Raaju praise himself.'
c. hari raaju-vinda tann-annu hogaL-i-koLL-uvante maad-id-a
Hari Raaju-INSTR self-ACC praise-REFL-PRED make-PST-3SM
'Hari made Raaju praise himself.'

We assume that the representation of (36a-b) is (37):

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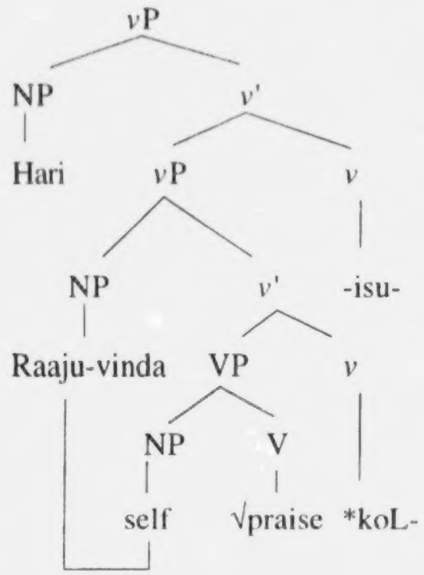
[13] An alternative description of this analysis is that all syntax is covert and that it is only at LF (now equivalent to PF) that words enter into the representation.

(37)



Raaju, bearing the inherent instrumental case, does not move to get case and so we do not generate the configuration which licenses *-koL*. [spec, *v*P] is filled at LF.[14]

---

[14] The complementarity between the causative and reflexive breaks down, however, in a couple of cases. First, causative can be embedded under reflexive, as in (i):

(i) Hari Raaju-vinda tann-annu hogaL-isi-koLL-utt-aane
Hari Raaju-INSTR self-ACC praise-CAUS-REFL-NPST-3SM
'Hari makes Raaju praise him.'

This suggests that in order to get the appropriate case marking the causee requires the causative morpheme to surface. The appropriate analysis will probably result from the multiple *v*Ps in this sentence. If we did not pronounce the causative morpheme here, the verb would be indistinguishable from a simple transitive reflexive verb. The details of getting this to work out elude me at present.

Second, there is a productive way of turning a dative-subject verb into a nominative subject verb by adding both the causative and reflexive to it. I also have no analysis of this fact:

(ii) Hari-ge jvara ban-t-u
hari-DAT fever-NOM come.PST-3SN
'Hari got a fever.'

(iii) Hari jvara-vannu bar-isi-koND-a
Hari fever-ACC come-CAUS-REFL.PST-3SM
'Hari got a fever.'

4.3.2. Interpreting *v*P with no specifier.

In the previous section we noted that the agent theta-role is not assigned by any syntactic mechanism. Instead, this role is entailed by the [*v* [VP]] configuration and can be assigned to anything in the sentence which could plausibly fill it. There are several reasons to believe this to be the right analysis. I will examine these in turn.

4.3.2.1. Roll

The verb *urulu-* (*roll*) allows either an animate or inanimate subject. Either of these is possible with or without the verbal reflexive on the intransitive variant:

(38) a. huDuganu bettada meele urul-id-a
boy-NOM hill over roll-PST-3SM
'the boy rolled down the hill.'
b. huDuganu bettada meele urul-i-koND-a
boy-NOM hill over roll-PP-REFL.PST-3SM
'the boy rolled down the hill.'
(39) a. chenDu bettada meele urul-i-tu
ball-NOM hill over roll-PST-3SN
'the ball rolled down the hill.'
b. chenDu bettada meele urul-i-koND-i-tu
ball-NOM hill over roll-PP-REFL.PST-3SN
'the ball rolled down the hill.'

If the subject is animate, then the verbal reflexive is incompatible with an accidental interpretation, i.e., the interpretation in which the cause of the event is external to the element undergoing a change (cf. example (12) ff.):

(40) a. huDuganu tann-iche-yinda-lee bettada meele urul-id-a
boy-NOM self-will-INSTR-EMPH hill over roll-PST-3SM
'the boy rolled down the hill deliberately.'
b. huDuganu tann-iche-yinda-lee bettada meele urul-i-koND-a
boy-NOM self-will-INSTR-EMPH hill over roll-PP-REFL.PST-3SM
'the boy rolled down the hill deliberately.'
c. aaghaata-dinda huDuganu bettada meele uruL-id-a
accident-INSTR boy-NOM hill over roll-PST-3SM
'the boy rolled down the hill accidentally.'

d. * aaghaata-dinda huDuganu bettada meele urul-i-koND-a
accident-INSTR boy-NOM hill over roll-PP-REFL.PST-3SM
'the boy rolled down the hill accidentally.'

However, if the subject is inanimate, the verbal reflexive is required on the externally caused interpretation, as indicated by the presence of the dative adjunct:

(41) a. gaaL-ige chenDu bettada meele uruL-i-koND-i-tu
wind-DAT ball hill over roll-PP-REFL.PST-3SN
'Because of the wind, the ball rolled down the hill.'
b. * gaaL-ige chenDu bettada meele urul-i-tu
wind-DAT ball hill over roll-PST-3SN
'Because of the wind, the ball rolled down the hill.'

So this means that the causative interpretation depends on the animacy of the subject. If the subject is animate, the subject itself must be interpreted as the causer when the reflexive morpheme is present, but if the subject is inanimate and the verb is reflexive-marked, some other external cause is required. These facts follow from an analysis in which the agent/causer theta-role is not assigned syntactically but is determined by interpretive principles operating on the structure. Because the animate NP is a possible causer of a rolling event, it is interpreted as the causer in the reflexive-marked variant even though it is syntactically assigned the theme theta-role. On the other hand, the inanimate NP cannot be interpreted as the cause of a rolling event and so some other, external, element is interpreted as causer.

4.3.2.2. Externally Caused Transitives: Alienating the Inalienable

I noted above that intransitive verbs marked with the verbal reflexive were interpreted as though there were some external cause responsible for the event. I described such sentences as monadic causatives, capturing both their causative event structure and their monadic status. We find similar interpretations of transitive sentences marked with the verbal reflexive (Lidz 1996):

42) a. hari kannu-gaL-annu tere-d-a
Hari eye-PL-ACC open-PST-3SM
'Hari opened his eyes.'

b. hari kannu-gaL-annu tere-du-koND-a
Hari eye-PL-ACC open-PP-REFL.PST-3SM
'Hari opened his eyes.'

43) a. hari tale-yannu eTT-id-a
Hari head-ACC lift-PST-3SM
'Hari lifted his head.'
b. hari tale-yannu eTT-i-koND-a
Hari head-ACC lift-PP-REFL.PST-3SM
'Hari lifted his head.'

The reflexive-marked variants of these sentences differ from the bare transitives in the way that the action denoted by the verb was performed. (42a) describes a normal action of eye-opening, that is, one in which internal properties of the eye muscles are responsible for the actual lifting of the eyelids. (42b), on the other hand, describes a situation in which Hari uses his hands to open his eyes. Similarly, (43a) describes Hari lifting his head in the normal way that heads are lifted, i.e., through the muscles of the head and neck. (43b), on the other hand, would be used to describe a situation in which Hari's head has been cut off and his body reaches down and lifts the detached head from the floor. In sum, the subject in the reflexive-marked sentences in (42-43) seems to be interpreted simultaneously as though it were connected to the object via the inalienable possession relation and as though it were an independent causer. The inalienable possession relation is attenuated in the reflexive-marked variants of these sentences.[15] Support for this conclusion comes from instrumental phrases, which are only licensed in these sentences when the verb is reflexive-marked:

(44) a. * hari kai-gaL-inda kannu-gaL-annu tere-d-a
Hari hand-PL-INSTR eye-PL-ACC open-PST-3SM
'Hari opened his eyes with his hands.'

---

[15] The non-reflexive variants are actually unspecified as to who possesses the body part. In other words, (42a) can also describe a situation in which Hari opens someone else's eyes. An explicit genitive can distinguish these:

(i) Hari tann-a kannu-gaL-annu tere-d-a
Hari self-GEN eye-PL-ACC open-PST-3SM
'Hari opened his own eyes.'

(ii) Hari awan-a kannugaL-annu tere-d-a
Hari he-GEN eye-PL-ACC open-PST-3SM
'Hari opened his (someone else's) eyes.'

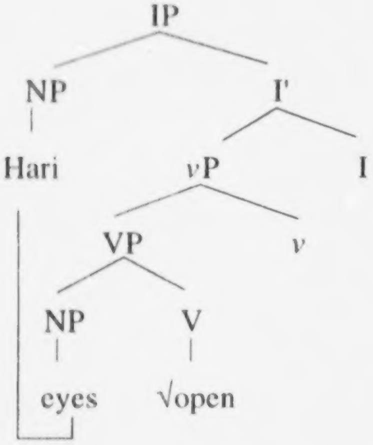
b. hari kai-gaL-inda kannu-gaL-annu tere-du-koND-a
Hari hand-PL-INSTR eye-PL-ACC open-PP-REFL.PST-3SM
'Hari opened his eyes with his hands.'

(45) a. * hari kai-gaL-inda tale-yannu eTT-id-a
Hari hand-PL-INSTR head-ACC lift-PST-3SM
'Hari lifted his head with his hands.'

b. hari kai-gaL-inda tale-yannu eTT-i-koND-a
Hari hand-PL-INSTR head-ACC lift-PP-REFL.PST-3SM
'Hari lifted his head with his hands.'

The analysis of the verbal reflexive proposed above requires that there is no [spec, *v*P] in the (b) examples of (42-43). Given that these are transitive structures, we must assign these sentences the same representation assigned to the reflexive example in (27). A chain is formed between the subject and object, resulting in deletion of the subject trace. The LF representation for (42b) is:

(46)



Two questions arise from this structure. First, is it justifiable to form a chain between the subject and object in these cases? Second, why do we interpret the predicate in such an unusual way in these cases?

In order to answer the first question, we must first look at the Near-reflexivity cases discussed in Lidz (1996, 1997a). We find a difference in interpretation of reflexive sentences which differ in the choice of anaphor used:[16]

---

[16] There is some variation with respect to the cooccurrence of the complex anaphor with the verbal reflexive. For some speakers, it is possible to have the

(47) a. hari tann-annu hoDe-du-koND-a
Hari self-ACC hit-PP-REFL.PST-3SM
'Hari hit himself.'
b. hari tann-annu-taane hoDe-du-koND-a
Hari self-ACC-self hit-PP-REFL.PST-3SM
'Hari hit himself.'

Imagine a situation in which Hari is a famous person and that a statue of him has been erected in a museum. When he gets to the museum to see the unveiling of the statue, he finds the statue appalling and becomes angry. Now, one of two things can happen. In one scenario, he is so upset with himself for allowing such a horrible statue to be built that he begins to hit himself, bemoaning his stupidity. In a second scenario, he is so angry with the statue-builders that he begins to hit the statue in an attempt to destroy it. The simplex anaphor in (47a) is only compatible with the first interpretation, i.e., the one in which Hari is both the hitter and hittee. The complex anaphor in (47b) is compatible with either interpretation.

Lidz (1996, 1997a) argues that this difference in interpretations is due to the semantic properties of the anaphor. The simplex anaphor requires complete identity with its antecedent, while the complex anaphor can pick out an entity which is representationally related to its antecedent. Thus, the representation for (47a) is (48a), while the representation for (47b) is (48b):

(48) a. $\lambda x\ [\text{hit}\ (x, x)]\ (\text{Hari})$
b. $\lambda x\ [\text{hit}\ (x, f(x))]\ (\text{Hari})$

The morphologically complex anaphor denotes a function which takes the antecedent as input and returns something which is representationally related to that antecedent. I call this function the "Near-reflexive" function. For the analysis being developed here, the simplex anaphor is connected to the antecedent by a chain because together they pick out a single entity. The complex anaphor is connected to the antecedent by a chain because the interpretation of both NPs is determined by making reference to a single entity.

We can view a reflexive-marked transitive like (42b), repeated here as ((49), as an instance of Near-reflexivity.

---

complex anaphor without the verbal reflexive while for others the verbal reflexive is required no matter what form of anaphor is used. I put aside discussion of the first set of speakers for the purposes of this paper.

(49) hari kannu-gaL-annu tere-du-koND-a
Hari eye-PL-ACC open-PP-REFL.PST-3SM
'Hari opened his eyes.'

The subject and the inalienably possessed object are semantically covalued; the interpretation of both NPs is determined by making reference to a single entity, i.e., Hari.[17] A chain can therefore be formed between the subject and object, as in (46). The chain, which bears only the object theta-role, requires that *Hari* and *kannugaLannu* (eyes) together identify a single entity (Hari) and at the same time identify two independent entities. The fact that there are two NPs with lexical content in the chain entails that two entities are semantically identified. At the same time, the chain itself imposes the interpretation that these two NPs are alternative expressions of the same entity. The externally caused interpretation of ((49) comes from a combination of the interpretive properties of the *v*-VP configuration and the interpretive properties of the chain. The *v*-VP configuration requires a causative interpretation, as we have seen. The causative role can now be identified with the chain bearing the object role because this chain picks out two entities (Hari and his eyes), even though these entities are semantically covalued. Thus, Hari is interpreted independently as though he were the cause of the event and the affected entity in the event.

Further evidence for a nonstructural account of the assignment of the 'agent' theta-role comes from reflexive-marked transitive sentences without a body-part as an argument. In such cases, the causer role is fully externalized. For example, (50a) has the interpretation that Hari acted on his shirt, causing it to tear in the normal causative fashion, while the reflexive-marked (50b) has the interpretation that something external to Hari caused the shirt to tear, perhaps if the shirt got caught on a nail:

(50) a. Hari angiy-annu har-id-a
Hari shirt-ACC tear-PST-3SM
'Hari tore his shirt.'

---

[17] Semantic covaluation requires more than a simple semantic dependence. Rather, both NPs must ultimately lead to the same entity. A representation of Hari ultimately picks out Hari. Thus, a sentence like "Hari opened his book," does not involve semantic covaluation. While it is true that the referent of "his book" is determined by making reference to Hari (at least on the bound variable interpretation of the pronoun), the book is what is ultimately referred to, not Hari. Therefore, such an example does not involve Near-reflexivity or semantic covaluation.

b. Hari angiyannu hari-du-koND-a
Hari shirt-ACC tear-PP-REFL.PST-3SM
'Hari got his shirt torn.'

This fact provides further support for the idea that the identification of the external causer depends on the nature of the NPs involved and not solely on syntactic structure. If the two NPs in a chain can be interpreted as an agentive individual, as when the tail of the chain is a metonymic (i.e., body part) representation of the subject, then the subject NP is construed as the external causer. On the other hand, if the chain cannot be interpreted agentively, as when the tail of the chain is less directly construable as the object denoted by the head of the chain, then a separate external cause is required. That is, in (50b) we cannot construe the shirt as a part of Hari and so we construe Hari and the shirt together as the affected entity, forcing the causer role to be interpreted as something outside the sentence.

5. Conclusions

In this paper I have argued that a theory of morphology-syntax interactions in which morphological material is determined on the basis of syntactic representations can explain the distribution of causative and reflexive morphemes in Kannada better than a theory in which morphological material provides the atomic units of syntactic representation. In particular, I have shown that the causative and reflexive morphemes are alternative spell-outs of a light-verb implicated in sentences with complex event structures. The causative morpheme spells out this head if it has a specifier while the reflexive morpheme spells out this head if it has no specifier. I have further shown that some potential counterexamples to these claims can be accounted for if we adopt a theory of anaphora which requires that semantically covalued NPs are connected by a chain in the syntax (Lidz 1997). Under this analysis, it is only at LF that the 'causative' head has no specifier, conditioning insertion of the reflexive morpheme. The analysis leads us to the conclusion that morphological insertion applies to the LF representation. We therefore derive a theory of grammar in which there is a single level of representation which serves as the input both to morphophonology and to semantics.

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Vietnamese 'Morphology' and the Definition of Word

Rolf Noyer

1. Introduction

According to the Lexicalist Hypothesis, it is the responsibility of the Lexicon to generate the well-formed words of a language, where by 'word' what is meant is a structure which is 'opaque to all sentence-level operations and descriptions' (Di Sciullo & Williams 1987:52).[1] If this claim is to have any content however, it must be shown that a variety of independent criteria converge on the notion 'word' as distinct from any other syntactic structure. Recent work under the heading 'Distributed Morphology' (Noyer 1997, Halle & Marantz 1993) has questioned the existence of a clear-cut boundary between word-syntax and morpheme-syntax, returning to the assumptions of a pre-lexicalist generative syntax such as was found in *Syntactic Structures* (Chomsky 1957). The functions attributed to the Lexicon are in this theory distributed into various other modules of grammar, including a generalized (morpho)syntax, a component of autonomous Morphology largely concerned with readjustment rules and allomorphic choice, and an Encyclopedia associating idiomatic meanings with phonological forms (sometimes in specific environments).

In this paper I examine Vietnamese, a language normally thought devoid of morphology and for which the debate regarding the defintion of 'word' was notoriously contentious in structuralist treatments (Thompson 1963). The criteria normally associated with wordhood are shown to apply to domains which are not syntactically opaque at all, considerably weakening the thesis of word atomicity.

Of the various criteria which normally identify 'words' as opposed to syntactic forms we can identify several of importance here. First, inasmuch as the lexicon produces 'words' and 'words' project syntax with a compositional semantics, we normally equate 'word' with sign, that is, with the domain of idiomaticity. Second, syntax is said to be 'productive' while morphology need not be. That is, the selectional restrictions holding among morphological constituents can be arbitrary (*London-er* vs. *Boston-ian)* while those holding among words are in some sense principled or systematic. Third, the word is typically the domain of morphophonological operations such as reduplication, hence *fuzzy-wuzzy* is one word, but *fuzzy animal* need

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[1] This paper was originally presented at the Conference on Lexical Structures, Wuppertal, August 28, 1995. I would like to thank Alec Marantz, Heidi Harley, and an anonymous reviewer for their comments. Thanks also to Sonny Vu for valuable discussion and for data judgments.

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not be one word. Finally, any domain identified as a word from these criteria should be opaque to syntax.

Data from Vietnamese presented here show that none of the criteria mentioned above—idiomaticity, arbitrary selectional restrictions, morphophonology—correlates with 'syntactic atom' in any necessary way. Instead, the syntactic atom may be (1) meaningless in isolation, (2) unproductive in its composition and (3) morphophonologically related to other syntactic atoms via a morphophonological process, reduplication. There are no criteria converging on a unitary notion 'word' in Vietnamese. A consequence of this is that Vietnamese grammarians have disagreed strenuously about whether certain facts are to be labelled 'morphology' or 'syntax.' I propose here that the distinction, as a clear-cut dividing line, is vacuous.

The data in this paper come from published sources as well as native speakers. I have consulted two important studies of Vietnamese morphosyntax from a generative perspective, Phong (1976) and Nhàn (1984). The latter is especially detailed in its classification and explication of the variety of reduplicative and compound structures. A native speaker consultant, Phúc Thị Ngọc Lê, provided patient and insightful assistance during the academic year 1994-1995. Finally, I have benefited from discussions and comments by Sonny Vu, whose recent work (1998a, 1998b) promises to be a significant expansion (and perhaps correction) of the ideas presented below.

2. Idiomaticity and Availability

It will be convenient to begin by defining two important notions: *idiomaticity* and *availability*. Consider the following pairs of expressions.

(1)		English	Vietnamese	
	a.	*atlas* 'book with maps'	*đèn* lamp	'lamp'
	b.	*per-cuss-ion* 'drums, etc.'	*đế đô* emperor-metropolis	'capital'
	c.	*huckle-berry* 'kind of berry'	*vườn tược* garden-?	'gardens'
	d.	*carpal tunnel syndrome* 'pathology of the wrist'	*quốc phục* national costume	'national costume'
	e.	*hard-nose* 'strict person'	*đèn sách* lamp book	'to study'
	f.	*take the veil* 'become a nun'	*xoe tơ kết tóc* bind silk weave hair	'get married'

Following the usage of Marantz (1995), I will use the term *idiom* to refer to any phonologically identified structure whose meaning is not predictable from the meaning of the subparts of the structure along with universal principles of interpretation of the structure. All the expressions in (1) are idioms in this sense, even *atlas* which is monomorphemic. (The meaning of *atlas* is not predictable from its subparts since *atlas* has no subparts.) Idiomaticity is strictly correlated neither with indivisible constituents ('morphemes') nor with words nor with phrases. Although, as Aronoff (1976) puts it, 'the word gravitates to the sign,' being a sign and being a word in fact have no necessary connection, and many signs are non-words in Vietnamese. For Vietnamese, and probably for all languages, it is impossible to dismiss idiomatic superword-sized syntagms as an exceptional excrescence on the lexicon.

I will use the term *available* (cf. Fr. *disponible* from Corbin 1987) to refer to an element whose presence in the string does not imply the presence of some member of an arbitrary list. English *per-, -cuss-, huckle-* and *carpal* are 'unavailable' in this sense (perhaps also *-ion)*, since they combine with an arbitrarily limited set of forms; for example, *huckle-* combines only with *berry*, and for most speakers *carpal* is not an adjective referring to the wrist, but rather occurs only in the phrase *carpal tunnel syndrome*. The remaining terms are available, that is to say, for a given expression containing *veil* or *nose* one can make no inferences regarding a completely arbitrary set of other terms which must also occur in that expression.

Considering only idiomaticity and availability, there are no differences between the English expressions in (1) and the analogous Vietnamese ones. Contrary to common claims that Vietnamese is a canonically 'isolating' language in which the syllable and the morpheme or word are coextensive, in fact the syllable and the *idiom* as defined here are not normally coextensive in Vietnamese. Phong (1976), for example, estimated that approximately seven-tenths of dictionary entries in Vietnamese are idiomatic polysyllabic collocations; a not insignificant proportion of these consist of at least one unavailable term in the sense employed here.

Collocations such as *đế đô* consist of 'unavailable' parts which do not occur in isolation, cf. *per-cuss-ion, astro-naut, heckel-phone.*[2] The semantic contribution of unavailable parts can often be surmised from collocations in which these parts also appear; for *đế* and *đô* some are given in (2):

---

[2] The heckelphone, invented in 1904, is a rarely used baritone oboe larger than an English horn and smaller than a bassoon.

(2) a. *đế quốc* 'empire'
emperor nation

b. *hoàng đế* 'emperor'
emperor emperor

c. *đô thị* 'city'
metropolis city

d. *thủ đô* 'capital'
? metropolis

The four collocations above each consist of unavailable parts, although in all but the last case Nguyễn Đình Hoà (1991) provides a meaning for both parts. Even so, the resultant forms have idiomatic readings regardless of the semantic contributions provided by the unavailable elements within them, much like the sets {*per-ceive, con-ceive, de-ceive*}, {*per-ceive, per-tain, per-cussion*} or {*heckel-phone, saxo-phone, sarruso-phone, xylo-phone*}.[3]

Collocations such as *vườn tược* 'gardens' and *quốc phục* 'national-costume' are analogous to *huckle-berry* and *carpal tunnel syndrome.* All these have idiomatic readings as well as one unavailable term. For instance, the syllable *tược* is unusable in isolation and occurs exclusively with *vườn* 'garden': the semantic contribution of *tược* is very limited, giving perhaps no more than plurality. In *quốc phục* 'national-costume' or a similar example such as *đỏ kè* 'red-scarlet', the second term has a more identifiable semantic contribution, but is nevertheless limited to only this collocation.

Finally, collocations of free forms such *đèn sách* 'lamp-book' = 'to study' (an exocentric NN compound with verbal syntax) or *xoe tơ kết tóc* 'bind silk weave hair' = 'get married' consist of available terms with suppression of the compositional meaning, cf. *hard-nose* or *take the veil.*

2.1. Separable Collocations and Availability

Exempting idiomaticity and availability from consideration, on what basis, then, is *vườn tược* 'gardens' two 'words' while *huckle-berry* is only one? According to the thesis of atomicity, we can determine if *vườn tược* is one word or two by assessing whether any 'sentence-level description or process' can see into *vườn tược.*

Data such as in (3) are thus immediately relevant (I gloss as XX any unavailable term).

---

[3] Because the parts are unavailable, we naturally expect there to be ill-formed combinations such as **de-cussion.*

(3) a. *Tôi lo vườn tược.*
I care.for garden XX. 'I take care of gardens'

b. *Tôi lo vườn lo tược.*
I care.for garden care XX. 'I take care of gardens'

c. *Tôi lo vườn với tược.*
I care.for garden and XX. 'I take care of gardens'

d. ?? *Tôi lo vườn với lo tược.*
I care.for garden and care.for XX. 'I take care of gardens'

As shown in (3a, b), certain idiomatic collocations are syntactically separable. In this instance, the two terms of *vườn tược* are each preceded by *lo*, 'take care of.' Because suppression of conjunctions is possible in Vietnamese, it might be surmised that (3a) reflects a sentence like (3c) with an overt conjunction linking the two halves of the idiomatic collocation. But native speakers report that (3d), with syntactic splitting of the idiom *and* an overt conjunction, is significantly degraded.[4] I will thus take it as a working hypothesis that the structure underlying (3a) does not have a null conjunction syntactically.

A variety of contentful predicates can separate idiomatic collocations:

(4) a. *Tôi xay nhà cửa.* → *Tôi xay nhà xay cửa.*
I build house door → I build house build door.
'I build a house.'

b. *Tôi không muốn đèn (không muốn) sách.*
I NEG want lamp (NEG want) book
'I do not want to study'

Here the collocations *nhà cửa* 'house-door' = 'habitable, furnished house, i.e. a home' and *đèn sách* 'lamp-book = study' are divisible. The property of being the theme-object of the predicates 'build' or 'not want' is not an inflectional category, and hence cannot be part of that restricted putative 'shared vocabulary' of morphosyntactic properties visible to both word-internal and word-external operations. As Nhàn (1976:35) remarks, '… the fact that syntactic rules operate across the morphological-syntactic boundary seems first to challenge the traditional notion of the word … and secondly, to suggest that the boundary between morphology and syntax is indistinct.' To maintain the thesis of atomicity we must claim that *nhà cửa*, *vườn tược*, and *đèn sách* consist of two words, despite the fact that these collocations have either an idiomatic reading or contain unavailable parts.

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[4] However, wh-extraction of one term is impossible for both separable compounds and for phrases with an overt conjunction, so the two types both obey the Coordinate Structure Constraint. Thanks to an anonymous reviewer for pointing out the relevance of this data; thanks to Sonny Vu for soliciting judgments from speakers.

Not all polysyllabic collocations are divisible in this manner. For example, *xà-phòng* 'soap' (from French *savon*) and total reduplicatives such as *ba-ba* 'tortoise' are not divisible:

(5) a. **Tôi uống xà uống phòng.*
I drink sa– drink –von. 'I drink soap'

b. **Tôi có ba có ba.*
I have *ba* have *ba*. 'I have the tortoise'

Similarly unsplittable are *ô tô* 'car' (from French *auto*) or *cào-cào* 'grasshopper.'

In both these cases the operative restriction is that neither term is 'available' in the sense described above. Although the second term of *vườn tược* 'gardens' is also not available, the restriction on separability appears to require only that at least one term be at least somewhat available. The precise semantic contribution of *tược* is underdetermined, much like *wood-* in *wood-chuck* or *musk-* in *musk-rat* (both folk etymologies from borrowings from Algonquian). But as Aronoff (1976) so succinctly put it, 'what is essential about a morpheme ... [is] ... not that it mean, but rather merely that we be able to recognize it.' Put somewhat differently, once a phonetic string has a 'life of its own'—semantic or otherwise—it may, although need not, become a morphological constituent in its own right.

To summarize, both *đèn sách* 'lamp-book = study' and *vườn tược* 'gardens' are syntactically separable since both contain at least one sufficiently available term. Only one available term is necessary, since the other term acquires autonomy in virtue of being the residue left over when the available term is removed. In the case of *xà-phòng* 'soap' and *ba-ba* 'tortoise', neither term is available and no splitting is possible. In consequence, polysyllabic place names such as *Hà-Nội* 'Hanoi' or *Sai-Gòn* 'Saigon' are completely unsplittable. The task which we turn to in sections 2.2–2.3, then, is a formal characterization of the formal nature of and constraints on the splitting phenomenon.

2.2. Compounds Which are Inseparable

Many idiomatic collocations with fully available terms are also not separable. Collocations which specifically do *not* have an additive or 'dvandva' reading cannot be split into co-ordinate structures. Consider the following:

(6) a. *Tôi đã ngã (*đã) lòng.*
I PAST fall PAST heart.
'I despaired'

b. *Tôi sơn nhà (*sơn) tắm.*
I paint house (*paint) bathe.
'I paint the bathroom.'

c. *Tôi có ống (*có) khói.*
I have tube (*have) smoke.
'I have a chimney.'

(6a) and (6b) cannot be potential co-ordinate structures for syntactic reasons. The first, *ngã lòng* 'fall heart' = 'to despair' is a verbal VN collocation, while the second, *nhà tắm* 'house bathe' = 'bathroom' is a nominal NV collocation.

(6c) is more interesting, being an idiomatic NN collocation which is however not potentially subject to a dvandva interpretation. In *ống khói* 'tube-smoke' = 'chimney' the relationship between the parts is not coordinate or additive; rather, a chimney is a tube *for* smoke. Similar 'subordinating' collocations such as *nứơc mắt* 'water-eye' = 'tear' (water *from* eye) or *nứoc lửa*'mountain-fire'= 'volcano' (mountain *of* fire) are inseparable. The hypothetical split form is syntactically well-formed, with a coordinate [V_1 N_1 (and) V_1 N_2] structure, allowing a literal reading such as 'I have a tube and have smoke,' but the idiomatic reading does not survive the split.

The facts illustrated in (6) may serve to establish two things. First, it might be concluded that the unseparability of *ống khói* 'tube-smoke' is evidence that this collocation is a (compound) 'word' and so is opaque to syntactic processes, much like English *bagpipe*. On this view, the separability of *nhà cửa* 'house-door' = 'habitable home' is evidence that this collocation is an idiomatic phrase, much like *French horn* (cf. *He plays the French and English horns*). But this analysis is unsatisfactory insofar as it fails to explain why in Vietnamese only those collocations which require a subordinating structure semantically are also unsplittable.[5]

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[5] Put differently, only collocations which do not involve a relation of semantic subordination (argument-taker to argument) can be separated. Heidi Harley points out that this fact may be part of a more general fact: coordinability is permitted only to the extent that the subparts have a similar syntactic and interpretive role:

(i) Chris turned the oxygen on and the acetylene off.
(ii) ?Kim threw the towel in and the garbage out.
(iii) *The CIA kept a file and tabs on Jane Fonda.

2.2.1. The Encyclopedia in Distributed Morphology

Instead, I will attempt to show that a more satisfactory explanation is available if both separable dvandva collocations and inseparable subordinating collocations are analyzed as consiting of two syntactic terms.

To this end, it will be useful to review certain recent proposals of Marantz (1995, 1997) regarding the interpretation of idioms. On Marantz's proposal, a speaker's knowledge of language must contain a list of idioms (such as were defined earlier) with information regarding their conventionalized meanings: this list is known as the Encyclopedia. The Encyclopedia bears a certain resemblance to the *applicateur d'idiocyncrasie* of Corbin (1987), whose function is to 'apply' conventionalized meanings to words such as *transmission.* But the Encyclopedia differs from Corbin's *applicateur* in several key respects.

First, the Encyclopedia supplies all conventionalized meanings, including those of indivisible constituents such as *atlas* as well as those of phrases like *take the veil.* Second, the meanings so provided must, by hypothesis, be consistent with the meaning imposed by the structure of the idiom in question.

The notion of 'structural' meaning is difficult to state precisely, but has figured prominently in several research programs, including Construction Grammar (Fillmore and Kay 1993, Goldberg 1995) and studies relating to the acquisition of argument structure (Gleitman 1990, Gleitman et. al. 1996, Lidz 1998). In Distributed Morphology, it is assumed that syntactic structures are abstract representations without phonetic content (Halle & Marantz 1993). As such they consist solely of categories made available by universal grammar arranged in structures also made available by universal grammar. Following Hale & Keyser (1993), it is proposed that certain of these structural configurations have a canonical 'meaning,' particularly as regards verbal aspect, although the term 'meaning' here must be understood delicately. It is clearly not the case that the entire 'meaning' of a sentence such as *The atlas is on the table* arises from the syntactic structure of the sentence. On the view assumed here however, UG provides a set of configurations of categories and a canonical interpretation of these: all additional meaning is 'encyclopedic'—that is, culturally specific or 'private.' The Encyclopedia provides what might be termed 'semantic detail' beyond what is constructed from universal syntactic-semantic primitives.[6]

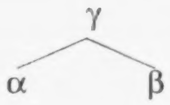
While (i) is fine, with *oxygen on* and *acetylene off* being both semantically and syntactically parallel, (ii) and even more so (iii) are degraded, having a joke or zeugmatic interpretation.

[6] Note that Distributed Morphology, unlike Construction Grammar, holds that structure/meaning correspondences are always universal, never language-specific.

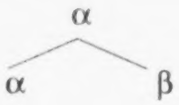
Insertion of phonetic material does not occur until after syntax: the choice of phonetic forms affects only 'conventionalized' meaning or 'semantic detail,' and has no consequences for those aspects of meaning which depend on the choice of configurations and abstract syntactic categories.

Consider now the two types of structures which a collocation of two terms may appear in. In (7a), the two terms are in a co-ordinate structure: neither term is the head. In (7b) on the other hand, one term—in this case the term on the right—is the head, and it projects itself as the category of the collocation:

(7) a.



b.



(7b) is the typical endocentric structure, where the whole is a projection of a part. Some semantic relation must hold in consequence of the inequality in the relationship of α and β here: in a theory with thematic role primitives, one could construe the relationship as 'theta-assignment,' although this interpretation of the relationship is not in fact crucial to the present account. (7a) differs from a standard exocentric structure in that γ, the category of the whole, is the same as the category of both α and β, but γ is not a projection of either α or β. While exocentric structures like (7b) are normally not admitted in X-bar theory (Stowell 1991, Chomksy 1995), I will assume that a structure like (7b) is possible to catpure asyndetic (conjunction-less) conjunctions or co-ordinate compounds. A different semantic relation will hold in this instance; whatever the relation in (7a) is, it cannot be the same as what would normally be called a theta-role assignment relation from one part to the other, which requires structure (7b). Instead, (7b) always has an "additive" or "conjunctive" interpretation, where the categories of both α and β have the same syntactic distribution as the category of γ.

2.2.2. Separable and Inseparable Structures

As discussed above, in Vietnamese idiomatic interpretations are preserved in co-ordinate structure only if the conventionalized 'meaning' of the idiom does not require the subordinate structure (7b). For example, although *ống khói* is an idiom with a meaning more specific than 'smoke-tube' it is still not the case that the idiomatic meaning cancels the structural relations holding among the parts of the idiom. Instead, 'tube-smoke' must have the head-modifier relation in syntax (7b), and the Encyclopedia supplements the meaning with such properties as distinguish chimneys from mere smoke-tubes. A fundamental tenet of the proposal is that conventionalized meanings are inherently situation-dependent and matters of cultural or personal idiosyncrasy. For each speaker of Vietnamese a chimney is distinct from a mere tube for smoke in ways which are of little interest to the theory of grammar.

Consider now the co-ordinate compounds discussed so far here:

(8) a. *nhà cửa* 'house-door' = home
b. *vườn tược* 'garden – XX' = 'gardens'
c. *đèn sách* 'lamp-book' = study

The Encyclopedia has the capacity to suppress or supply a conventionalized meaning of the minimal constituents of a structure. In the case of (8a), a hypothesis consistent with a dvandva interpretation of *nhà cửa* 'home' is that the Encyclopedia suppresses the conventionalized meaning of the second term *cửa* 'door' and supplies a meaning approximately like 'such amenities as make a house habitable, e.g. furniture.' (This approximates the paraphrase of my consultant.) However, a dvandva or additive interpretation is not really necessary on the present theory: all that matters is that no *subordinating* relation need hold among the parts. Thus, *nhà cửa* = 'habitable home' is consistent with structure (7a) inasmuch as neither *nhà* nor *cửa* is the head of the structure.

Similarly, it is possible that the Encyclopedia supplies to the second term of *vườn tược* 'gardens' the meaning 'garden'. Note that we obtain the result that *tược* by itself is meaningless because the Encyclopedia supplies the meaning of 'garden' to *tược* only when *tược* appears in a co-ordinate structure with *vườn*. Nevertheless it is perhaps imprecise to speak of *tược* as having the meaning 'garden.' It is equally consistent with the present account to assert that *tược* alone has no 'meaning' at all. Again what is crucially important is that whatever *tược* may 'mean', there need not be a syntactic relation of subordination between it and *vườn* 'garden.'

The case of *đèn sách* 'lamp-book' is especially interesting. Neither subpart of this collocation is a verb, yet the whole is syntactically verbal. What matters for separability is the structure must be *headless* : exocentric forms such as *đèn sách* are in fact separable, as predicted (see 4b), although the resulting structure treats the subpart nouns as verbs.

Consider again now unsplittable forms such as *ống khói* 'tube-smoke' = chimney. As we have seen, this collocation *is* splittable, but only with loss of idiomatic interpretation. Hence the issue is not syntax but rather the structures in which idiomaticity survives. Recall now that the Encyclopedia supplies conventionalized meanings to phonological representations within specific syntactic structures. The idiomatic interpretation of 'tube-smoke' = chimney is available only to a $[NN_N]$ structure in which one noun is the head and the other is subordinated to the head, i.e. to a head-modifier collocation. Splitting 'tube-smoke' into a series of co-ordinate VPs prevents the

Encyclopedia from supplying the idiomatic reading. For co-ordinate structure idioms, however, the Encyclopedia can supply the idiomatic reading *as long as the structure remains co-ordinate.*

2.2.3. The Syntactic Domain of Splitting

The extent to which idiomaticity is preserved under co-ordination is quite extensive. Consider a VV collocation such as *canh giữ* 'watch-keep' = 'guard':

(9) a. *Ông sẽ không canh (không) giữ bà.*
He FUT NEG watch (NEG) keep her.
'He will not guard her.'

b. ?**Ông sẽ không canh sẽ (không) giữ bà.*
He FUT NEG watch (FUT (NEG)) keep her.

In (9a) it is shown that co-ordination of [V] or of [NEG V] preserves idiomaticity. (It remains unclear to me whether the object DP *bà* 'her' is gapped or not in the first co-ordinate.) (9b), however, with co-ordination of [T (NEG) V] is considered ungrammatical by most speakers.[7]

Remarkably, idiomatic VV collocations can interdigitate idiomatic NN collocations, giving a [VNVN $_{VP}$] structure or a [NVNV $_{NP}$][8]:

(10) a. *Ông sẽ canh vườn giữ tược.* [VNVN $_{VP}$]
He FUT watch garden keep XX.
'He will guard the gardens.'

b. *Tôi sẽ uống cà nguội phê lạnh.* [NVNV $_{NP}$]
I FUT drink cof– cool –fee cold.
'I will drink the cold coffee.'

Syntactic separation is often used for stylistic effect and colors the expression with the speaker's attitude in a complex way. For example (10b) will be appropriate if the coffee is cold and 'no one wants it': hence the splitting operation in this instance communicates the speaker's disdainful attitude toward the coffee.

---

[7] Sonny Vu informs me that repetition of tense/aspect markers is ungrammatical according to speakers he has consulted. My consultant however did accept (9b), although certain analogous sentences were judged "wordy."

[8] V denotes either a 'verb' or an 'adjective': adjectives in Vietnamese are syntactically simply (stative) verbs.

In the following example, the VV idiom *dạy dỗ* 'teach-cajole' = 'educate' is interdigitated with the NN idiom *anh em* 'older brother-younger brother' = 'brothers':

(11) *Ông đã không dạy anh (không) dỗ em.*
He PAST NEG teach older.brother (NEG) cajole younger.brother
'He did not educate the brothers'

The literal meaning would imply that only the younger brothers were not cajoled, and only the older brothers were not taught. But the idiomatic or collective reading is also available, according to which it is simply the case that all the brothers were not educated.

Similar to this is (12), in which it is shown that [Adv V] can also coordinate without loss of idiomaticity; here the idiom is *ăn thua* 'win-lose' = 'rival one another'.

(12) *Bà và ông mãi ăn mãi thua.*
She and he always win always lose.
'She and he are always rivaling each other.'

Since winning and losing are mutually contradictory, it is clear that 'always' must modify the idiomatic reading of 'rivaling,' even though *mãi* 'always' is repeated in each conjunct.

Idiomaticity is preserved in even larger co-ordinations, such as complex predicates formed with *có thể* 'have ability to':

(13) *Bà đã có thể dạy đã có thể dỗ con gái.*
She PAST have ability teach PAST have ability cajole daughter.
'She was able to educate (her) daughter.'

Although 'wordy' the above sentence is fully grammatical.

There are however strict limits on which co-ordinate structures preserve idiomaticity. Specifically, repetition of the subject cancels the idiomatic reading. Compare (14a) with the idiomatic reading with (14b) without the idiomatic reading:

(14) a. *Ông sẽ không canh (bà) (?sẽ) không giư bà.*
He FUT NEG watch her (FUT) NEG keep her.
'He will not guard her'

b. *Ông sẽ không canh bà ông sẽ không giư bà.*
He FUT NEG watch her he FUT NEG keep her.
'He will not watch her and he will not keep her.'
≠ 'He will not guard her.'

Whatever the exact difference is between the idiomatic reading 'guard' and the literal reading 'watch and keep,' it is the judgment of my consultant that only the latter is available if the subject (and perhaps also Tense) is repeated. Similarly, compare the following:

(15) a. *Ông bà dạy cha dỗ mẹ.*
Grandfather grandmother teach father cajole mother.
'Grandfather and grandmother educate father and mother.'

b. *Ông dạy cha bà dỗ mẹ.*
Grandfather teach father grandmother cajole mother.
'Grandfather teaches father and grandmother cajoles mother.'

(15a) has the idiomatic and collective reading where the grandparents are educating the parents. (15b) with separation of the coordinate subject into the coordinate predicates has only the literal reading in which the mother is being cajoled (e.g. calmed from crying), but not necessarily instructed.

As confirmation of these semantic judgments, we see that for idioms one of whose parts is not available in the sense defined above, repetition of the subject (16a), or copying of any constituent larger than a clause (16b), induces ungrammaticality:

(16) a. * *Ông sẽ không canh vườn ông sẽ không giữ tược.*
He FUT NEG watch garden FUT NEG keep XX.
? 'He will not watch the garden (and) he will not keep the ??'

b. *Nguyễn đi vườn để học tiếng Pháp*
Nguyen go garden to study language French

đi tược để học tiếng Pháp.
go XX to study language French.

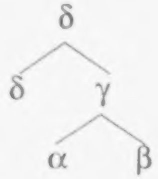
? 'Nguyen is going to the garden to study French (and) going to the ?? to study French.'

On the account presented here (16a,b) are not so much ungrammatical as they are meaningless, since, I propose, *tược* is supplied with conventional meaning by the Encyclopedia only if it is in a co-ordinate relation with *vườn* 'garden.' As was seen in (9b), repetition of tense/aspect is highly degraded, and repetition of the subject—which naturally entails repetition of an even larger structure—cannot allow an idiomatic interpretation for any speaker. These data confirm a hypothesis advanced by Marantz (1997:208ff.), namely that the structures made available to the Encyclopedia apparently do not extend beyond the vP or NegP dominating vP.[9] Consequently the second conjuncts of (16a, b) are not provided with any meaning, although syntactically they may be well-formed, much like Lewis Carroll's famous gibberish poem "Jabberwocky."

2.3. Formalization

More abstractly, we can model the relation between the non-split and split structures as follows:

(17) a.



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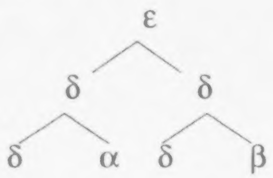
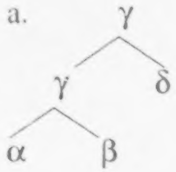
b.



A constituent δ taking as complement a co-ordinate structure γ consisting of α, β as parts is equivalent to a coordination of δα and δγ. This relationship is recursive; for example (9) exhibits three levels of embedding.

Similarly, a co-ordinate verb can split, attaching its complement to each part:

(18) a.



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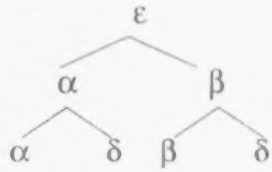
b.



Here γ, a co-ordinate structure consisting of α, β, takes δ as complement. This structure is equivalent to a co-ordination of αδ and βδ.

The essential insight behind (17) and (18) is that both involve a legitimate exchange of structural relations at PF. In (17) the head-complement relations between A and B (either A or B as head) is exchanged for a co-ordination of head-complement relations between A and the co-ordinate subconstituents of B. In other words, a head-complement relationship between A and B can be distributed over the co-ordinate subconsituents of either A or

---

[9] As Heidi Harley points out, exactly the same restrictions on idiomatic interpretation arise in the formation of Japanese causatives with *sase* and its allomorphs. As Harley (1995) shows, causative *sase* plus unaccusative predicates may yield idiomatic interpretations, but causative *sase* plus an unergative or transitive (including an already causativized form) permits only non-idiomatic interpretations. For further discussion, see Marantz (1997) and Harley & Noyer (1998).

B. If the subconstituents of A or B are not co-ordinate, distribution is impossible.[10]

Added evidence in favor of the relationships above is provided by the phenomenon of conjunction reduction (Nhàn 1984: 340ff). Conjunction reduction relates two idiomatic collocations that share a term with a reduced form in which the shared term occurs only once. Some examples are provided below (Nhàn 1984:343):

(19)	a.	*tâm lý sinh lý*→ heart reason living reason 'psychological and biological'	*tâm sinh lý* heart living reason 'psycho-biological'
	b.	*xuất khẩu nhập khẩu* → exit port enter port 'export and import'	*xuất nhập khẩu* exit enter port 'import-export'
	c.	*tiểu công nghiệp thủ công nghiệp* → small work task hand work task 'small industry and handicrafts'	*tiểu thủ công nghiệp* small hand work task 'combined small industry and handicrafts'

What is important about these forms is that they establish that the relations depicted in (17) and (18) are essentially bi-directional. Idiomaticity is preserved in both cases as long as the structure is co-ordinate.

These cases are no different than more familiar examples of the co-ordination of affixes or stems:

(20) a. *An anti–flea and –lice lotion* (Miller 1992:157)

b. *à la cinq– ou sixième entrevue* (Stendhal, Miller 1992:138)
at the five or six–th interview

c. *The meat– and potato–eating Scotsman* (Fabb 1984)

2.4. Discussion

The term 'lexicalized' in the sense of 'having an arbitrary form or an arbitrary meaning' has come to be nearly synonymous with 'object produced by an autonomous Lexicon' with the products of the Lexicon then being syntactically opaque domains, by the thesis of atomicity. What the Vietnamese data so far show is that syntactic objects need not be independently meaningful or available; rather, syntax can manipulate objects which are, from the semantic perspective, no different from the subparts of such English words as *saxo-phone, huckle-berry*, *musk-rat* or *astro-naut.* We must conclude that arguments to the effect that these latter forms cannot be syntactically constructed—because they contain unavailable terms or have an idiomatic interpretation—are groundless. More generally, arguments that a certain structure is not syntax can only be advanced in the context of a theory which states precisely what syntax can or cannot do in a strictly formal sense.

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[10] In the same manner, arithmetic expressions a*(b+c) = (a*b)+(a*c), but a*(b*c) does not necessarily equal (a*b)+(a*c).

3. Reduplicatives

So far the discussion has focused on idiomaticity and availability, but an additional potential criterion for wordhood is that word may be the domain for conditioning allomorphic choice or morphophonology (i.e. non-automatic phonology). Again, Vietnamese provides a challenge to this attempt at pinning down 'word', since allomorphic and morphological operations apply between splittable co-ordinate structures.

A great many morphemes in Vietnamese have a reduplicative counterpart. As discussed by văn Lý (1948), Thompson (1965), Phong (1976: 42 ff.) reduplication can be total, or the reduplicant can—in present-day terms—be specified for an onset, for tone, for nucleus, for a rime-plus-tone, or for an onset plus tone:

(21)	Reduplicant specification	structure	example gloss	
a.	None	?	*ba ba*	'tortoise'
b.	Onset	RED-BASE	*bối rối*	'embarrassed'
		BASE-RED	*tham lam*	'eager'
c.	Tone	RED-BASE	*đo đỏ*	'reddish'
		BASE-RED	*xố xộp*	'very spongy'
d.	Nucleus	BASE-RED	*mập mạp*	'fat'
		RED-BASE	*nhút nhát*	'timid'
e.	Rime & Tone	BASE-RED	*nhỏ nhặt*	'trivial'
f.	Onset & Tone	BASE-RED	*khét lẹt*	'strongly burnt'

Moreover, the Base of a reduplicative can be either available or unavailable. For example, the reduplicative *thình lình* 'suddenly' consists of two unavailable parts; in such case it is not immediately obvious which term is the base and which the reduplicant.

For most reduplicative structures, the base is collocated with a particular allomorph of the reduplicant, that is to say, a reduplicant allomorph which has some pre-specified structure:

(22)	Base	Reduplicant	Combination
a.	*đỏ* 'red'	Ton égal *đo đỏ*	
b.	*xấu* 'ugly'	Rime = *a*	*xấu xa*
c.	*bạn* 'friend'	Rime = *è*	*bạn bè*

In *đo đỏ* (22a), for example, the reduplicant allomorph chosen is a prefix specified only for the corresponding 'ton égal'. In the case of *đỏ* the corresponding tone is the high level tone (unmarked in the orthography).

From the point of view of availability and idiomaticity, Vietnamese reduplicatives have analogous forms in English as shown below (data from Marchand 1960):

(23)	Reduplicant specification	Structure	Example
a.	None	?	*goody-goody*
b.	Nucleus	RED-BASE	*chit-chat, criss-cross*
		BASE-RED	*jingle-jangle*
		?	*spick-and-span*
c.	Rime	RED-BASE	lacking
		BASE-RED	*super-duper, teeny-weeny*
		?	*hanky-panky, willy-nilly, hum-drum*

The *goody-goody* type includes total reduplicatives with zero available terms. The *chit-chat* and *jingle-jangle* type are nucleus or 'ablauting' reduplicatives with one available term but the *spick-and-span* type has no available term. Finally forms like *super-duper* and *hanky-panky* show rime reduplication with one and zero available terms.

Although morphophonologically the relation between the terms of a reduplicative is unequal (one term is the base while the other is not), from a structural perspective, reduplicatives are co-ordinate forms, since there is no subordinating relation between them in semantic terms. Consider *super-duper* or *hanky-panky* in English. Semantically there is no reason to suppose that *duper* is subordinate to *super* or vice-versa, since *duper* means nothing without *super*.

It should be unsurprising then that like the co-ordinate idioms discussed in section **2**, reduplicative collocations with at least one available term are syntactically splittable. Consider the following:

(24) a. *Tây của bà không gầy (không) gò.*
Hand belong grandmother not thin (not) REDUP
'Grandmother's hand is not thin.'

b. *Ô tô của tôi không đo (không) đỏ, nhưng mà tim tím.*
Auto belong me not REDUP (not) red, but-rather REDUP purple.
'My car is not reddish, but rather purplish.'

c. *Khách sạn có xa tin có xa tít, không?*
Hotel indeed far RED indeed far very, not?
'The hotel isn't very very far, is it?'
tin tít 'RED-very' < *tít* 'very' (available only with terms of distance)

Given the multiplicity of reduplicative structures in Vietnamese, a legitimate question to pose is whether these forms are in any way really different from other collocations. Perhaps, one might argue, the phonological relationship between the base and reduplicant in the forms in (21) is simply an accident. These collocations would then be no different from others such as *vườn tược* 'garden - XX' or *bẩn thỉu* 'dirty - XX', where the terms show no phonological resemblance aside from sharing a nucleus and tone, respectively (the latter classed with reduplicatives by văn Lý (1948), but not by Phong (1976)).

One reason for grouping reduplicatives as a class is that the various reduplicative processes have certain characteristic interpretations, among them emphatic ('very X'), 'attenuative' ('sort of, –ish'), iterative, pejorative and so forth (Phong 1976:46 ff.), and these semantic functions are correlated in some instances with classes of reduplicative allomorphs. For example, prefixation of a reduplicant specified for 'ton égal' gives the 'attenuated' reading while suffixation of a reduplicant specified only for tone gives an intensive reading:

(25) a. REDUP (ton égal) + *trắng* 'white' →
→ *trăng trắng* 'whitish' (attenuative)

b. *xốp* + REDUP (low broken tone) 'spongy' →
→ *xốp xộp* 'very spongy'

The base selects the reduplicant among several possible choices, much as English city names select the 'inhabitant' suffix: *Boston-ian, London-er.*

However, at least in the Northern Dialect, the reduplicative allomorph *-iêc* is highly available with a constant interpretation of 'and such like things/properties/actions,' much like colloquial American English 'and stuff':

(26) a. *học hiệc* 'study + REDUP(*-iêc*)' → 'study and stuff'
(Southern dialect: *học hành*)
b. *bạn biệc* 'friend + + REDUP(*-iêc*)' → 'friends and stuff'
(Southern dialect: *bạn bè*)

There are no restrictions on the use of this affix: even polysyllabic borrowing like *pê ni xi lin* 'penicillin' can be bases for *–iệc:*

(27) *pê ni xi lin pê ni xi liệc* 'penicillin and stuff'

Even more conclusive in establishing an independent process of reduplication is that reduplication can take as its base another reduplicative (Phong 1976: 44 ff.):

(28) a. (*phục* + REDUP(Nucleus = *i*)) + REDUP (high rising tone)
→ *phục phịch* + REDUP (high rising tone)
→ *phục phịch phúc phích*
'very fat'
b. (*lừ* + REDUP (Onset = *đ*)) + REDUP (low rising tone)
→ (*lừ đừ*) + REDUP (low falling tone)
→ *lừ đừ lử đử*
or:
REDUP (low rising tone) + (*lừ* + REDUP (Onset = *đ*))
→ REDUP (low falling tone) + (*lừ đừ*)
→ *lử đử lừ đừ*
'very fat'

The examples in (24) show what Phong (1976) calls 'redoublement en bloc' and Nhàn (1984) calls 'top-most expansion'. In this case, the terms of the base are repeated as a constituent, with some modification of one or both terms:

(29) En bloc: X Y → X' Y'+ X Y or X Y + X' Y'

This type of reduplication nearly always has an intensive reading and the reduplicant can appear prefixed or suffixed. (28b) gives an example where either is acceptable.

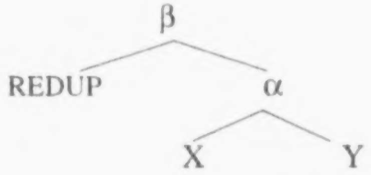
There are several subvarieties of reduplication en bloc, depending on the change induced in the reduplicant. The forms in (28) all have a reduplicant specified only for tone. Where the reduplicant is specified for a rime *R* then either term Y or both X and Y can have *R* overwritten:

(30) a. *liú lo* + REDUP(Rime = *ường*) → *liú lo liú lương*
'chirp incessantly'

b. *bông lông* + REDUP(Rime = *ang*) → *bông lông bang lang*
'wander aimlessly' (Nhàn 1984: 252)

Formally a reduplication en bloc conforms to the same structural requirements as were discussed in section **2.3** for syntactic reduplications:

(31)



Reduplication 'En Bloc'

Here the constituent REDUP takes α as its complement (and target). Phonetic realization maps this configuration to a string in which one or both constituents X and Y are overwritten by the reduplicative affix:

(32) $[\text{RED}\ [_{\alpha}\ X\ Y]] \rightarrow \text{RED}(X)\ \text{RED}(Y)\ X\ Y$

A second type of reduplication is termed 'redoublement intercalé' by Phong and 'atomic-expansion' by Nhàn:

(33)	*nhút nhát* → *nhút nhút nhát nhát*	'timid'
	hớn hở → *hớn hớn hở hở*	'cheerful'

In intercalated reduplication, the first term is repeated twice and then the second term twice:

(34) Intercalé: X Y → X' X Y Y' or X X' Y Y'

The exact meaning ascribed to the intercalated reduplicatives varies from author to author. Phong (1976) calls it 'attenuative' whereas Nhàn (1984) translates with 'consistently,' 'repeatedly,' or 'excessively.'

Some examples of total, intercalated reduplication are shown in (35). In (36) reduplication overwrites the base with tone only, and in (37) with onset only:

(35) *nhút nhát* → *nhút nhút nhát nhát* ‘timid’
hớn hớ → *hớn hớn hớ hớ* ‘cheerful’

(36) a. REDUP (ton égal) + (*lỏng lẻo*) → *long lỏng leo lẻo*
‘loose’

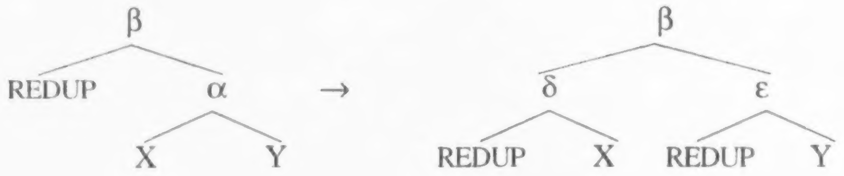
b. REDUP (ton égal) + *ngộ nghĩnh* → *ngồ ngộ nghình nghĩnh*
‘beautiful’ (Phong 1976:51)

(37) a. REDUP (Onset = /l/) + *khệnh khạng* → *lệnh khệnh lạng khạng*
‘walking in an air of exceeding importance’

b. *xơ xác* + REDUP (Onset = /r/) → *xơ rơ xác rác*
‘frayed’ → ‘ragged’

Again, the intercalated reduplications conform to the formal properties of syntactic reduplicatives discussed in section 2.3. Specifically, intercalation results from the distribution of REDUP as a sister of its complement α to a sister of both co-ordinate daughters of α:

(38) Reduplication ‘Intercalé’:



On this basis, I conclude that reduplicatives have the same expansion pattern as other dvandvas, where by ‘dvandva’ I mean simply any co-ordinate structure with no internal thematic relation. The reduplicants are both morphemes in the morphophonological sense and also syntactic atoms.

Not surprisingly, reduplications of reduplications are subject to further expansion. Examples (39–43) show separability by *hơi* ‘somewhat’, *không* ‘NEG’, and *sẽ* ‘FUT.’

(39) *Cô ấy hơi nhút (*hơi) nhút (hơi) nhát (*hơi) nhát*
RED´-RED´-RED-timid = a little timid
‘She is sort of a little timid.’

(40) *Hàng cây hơi ẩn (*hơi) ẩn (hơi) hiện (*hơi) hiện*
RED-appear-RED-disappear = shimmering
‘The row of trees is sort of a little shimmering.’

(41) *Em bé không khóc (*không) lóc (không) khoc (*không) liếc*
cry–RED–cry–RED´ = crying and carrying on
'Baby brother is not crying and stuff.'

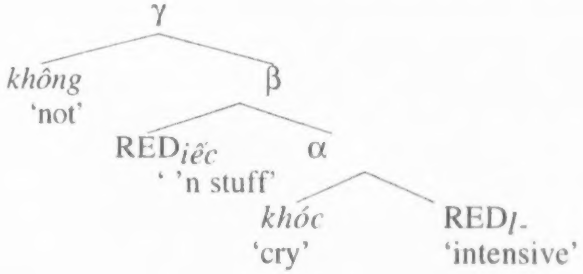
(42) *Cai nơ không long (*không) lỏng (không) leo (*không) lẻo.*
loose–RED–RED´–RED´´ = extremely loose
'The knot is not extremely loose (but still loose).'

(43) *Ăn mày sẽ lông (*sẽ) bông (sẽ) lang (*sẽ) bang*
vaga–bond-RED–RED = 'wander aimlessly'
'The beggar will wander aimlessly.'

As can be seen above, a form like *nhút nhút nhát nhát* 'timid' can be separated only once by a c-commanding element such as *không* 'NEG.' The judgment of my consultant suggests that this holds regardless of the form (intercalated vs. en bloc) of the reduplicative, and regardless of other factors such as the whether the reduplicant is a prefix or suffix, or total or partial.

To explain these judgments we have only to invoke the notion of cyclic application. Consider the derivation of ill-formed **không khóc không lóc không khoc không liếc* 'not crying and stuff'. The underlying constituency is given in (44) and the derivation is shown in (45):

(44)



(45) [$_\gamma$*không* [$_\beta$ RED$_{iếc}$ [$_\alpha$ *khóc*+RED$_{l\text{-}}$]]
[$_\gamma$*không* [$_\beta$ RED$_{iếc}$ [$_\alpha$ *khóc+lóc*]] α-cycle
[$_\gamma$ *không* [$_\beta$ *khóc+lóc khóc+liếc*] β-cycle
[*không khóc+lóc*] [*không khóc+liếc*] γ-cycle expansion

Supposing the the expansion rule is cyclic, it will in this instance apply on the cycle defined by the constituent γ in (44), giving a single expansion into well-formed [*không khóc+lóc*] [*không khóc+liếc*] 'not crying and stuff.' But further expansion will be impossible, because doing so will require *không* 'NEG' to 'see into' a subconstituent fully contained on the preceding cycle. This provides strong evidence that the structural configurations depicted in (45) are correctly viewed as syntactic, part of a generalized morphosyntax in which the notion 'word' plays no role.

4. Summary

On the basis of such well-known examples as *per-ceive, con-ceive, de-ceive,* Aronoff (1976) argued persuasively that morphemes do not require any fixed meaning nor do they require productive combinatory possibilities. They are purely formal elements. Abandoning the criteria of idiomaticity and productivity as criterial has extremely far-reaching consequences. On purely formal grounds we have found no evidence for separating ‘word’-sized units from ‘morpheme’-sized units in Vietnamese. Headless structures of all types are syntactically separable, whether dvandva, exocentric, reduplicatives, or reduplicatives of reduplicatives:

(46)	*nhà cửa*	‘house-door’ = home
	vườn tược	‘garden- XX’ = gardens
	đèn sách	‘lamp-book’ = study
	nhút nhát	‘timid-RED’ = timid
	nhút nhút nhát nhát	‘timid-RED-RED’ = rather timid

All these must be treated as syntactic constructions. Yet many have idiomatic reading and many contain unavailable parts, both typically construed as indicating ‘lexical’ status. Moreover, the relation of arbitrary allomorphic selection obtains between elements which are, on these grounds, syntactic atoms, and the morphophonological process of reduplication takes as its target elements which are syntactic atoms.

In sum, the criteria normally used to distinguish ‘word’ structures from ‘phrase’ structures have no force in Vietnamese, showing that the language learner cannot rely on any of these to distinguish a putative module of morphology from the syntax. Instead, principles of a generalized morphosyntax play an important role in determining the well-formedness of reduplicative and co-ordinate structures. An essential problem for future work is therefore whether such an enriched theory of morphosyntax can, for all languages, fully replace the set of operations normally imputed to the Lexicon.

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The Conflict Between Future Tense and Modality: The Case of *Will* in English

Anoop Sarkar

There have been differing views in the literature on what the semantics of *will* should constitute. Some consider *will* to be homonymous between a modal and a periphrastic future tense, while some deny that it is a future tense, indicating that its futurity is derived from its modality. This paper reviews the evidence for both views and draws a conclusion based on an empirical comparison.

1. Introduction

The debate about a semantics for *will* can be summarized as follows:

> Can the use of *will* in sentences like *He will speak tomorrow* be part of the morphological tense-system of English, i.e. is *will speak* the periphrastic future tense of *speak* just as *speaks* is the present tense and *spoke* is the past tense. Or should sentences like *He will have left already* (epistemic *will*) be taken as evidence that *will* is part of the modal system, parallel to *He must/can/may/... speak.* Is *will* part of the tense system or the modal system or is it simply homonymous.

In this paper we will review the evidence for both sides and try to motivate the need for a unified semantics for *will.* We ask the following two questions and then evaluate various extant analyses of *will* to see if they can account for the data.

- Can the future be empirically shown to be different from the past?
- Is the future distinguishable from modality?

2. The Problem

Before embarking on a search for a semantics for *will*, we must motivate the desire to show that the different senses of *will* should in fact be unified. As Kratzer (1977) points out, nobody would claim that a semantic description of the word *will* should try to capture whatever is common to the meaning of the two instances of the word *will* in (1).

(1) I will read your will at your death-bed.

This is an instance where the two *will*s are taken to be occurrences of two distinct words which just happen to look the same. Now consider the sentences in (2) with the interpretations given in parentheses with each sentence. The different interpretations of *will* in these sentences could be attributed to different *will*s: $will_a$, $will_b$, $will_c$.

(2) a. It will rain for hours in Stockport. *(generic statement about a place)* (Haegeman 1983)
b. John will have left already. *(epistemic)*
c. John will leave right now. *(directive)* (Hornstein 1990)

However, by analogy to the argument presented in Kratzer (1977) for modals such as *must*, we can shift the meaning of *will* in (2) to the single temporal meaning of *will* in (3) by changing the context (given in emphasis). A theory that maintains ambiguous *will*s must also have an additional neutral sense of *will* for the sentences in (2). However, this neutral meaning of *will* (embedded in an appropriate theory) is what we need to unify the semantic description of *will* and to account for the sentences in both (2) and (3). This is why seeking a unified semantics for *will* is a worthwhile goal.

(3) a. It will rain for hours in Stockport *tomorrow night due to a low pressure system moving into the area.* (future)
b. John will have left *by eight o'clock tomorrow night.* (future perfect)
c. John will leave *tomorrow.* (future) (Hornstein 1990)

3. Tense and Modality

Before we look at the particulars of *will* we must clarify some notational issues. In the literature, the term *tense* or *tense system* are sometimes used to denote completely different things.

1. In one sense, the term *tense* is used to indicate the tense morphology of a language which refers (although not exclusively) to the temporal representation. Usually this notion is used to denote the grammatical category realized by the inflectional element I(NFL).[1] We shall refer to this sense as *tense* or *tense morphology* in this paper.

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[1] However this meaning is not the only one adopted in the literature. For instance, in Hornstein (1990), tenses, modals, the perfect auxiliary and temporal modifiers are assigned the same temporal structures: Reichenbachian tense diagrams. He also assumes there is a one to one mapping between the tense morphology and his temporal structures.

2. In the other sense *tense system* is taken to mean the mechanisms of temporal interpretation common to all natural languages, for instance, a Reichenbachian tense diagram (Reichenbach 1947) or a Priorian past tense operator (Prior 1967). In this paper this sense is referred to as *temporal interpretation*.

These two definitions correspond to the grammatical (syntactic) tense distinction as opposed to the notional divisions of time represented in a natural language (Jespersen 1924:255). The distinction is important because an approach that argues that *will* is not formally a tense morpheme does not preclude the notion of future temporal interpretation, however a theory could also deny future temporal interpretation in natural language altogether. In this paper, we will attempt to choose between these two theories that have been proposed to account for future time reference shown schematically in Figures 1 and 2 (where, **S** represents the speech or utterance time, bold lines represent events and **E** represents a future event distinguished by the utterance).

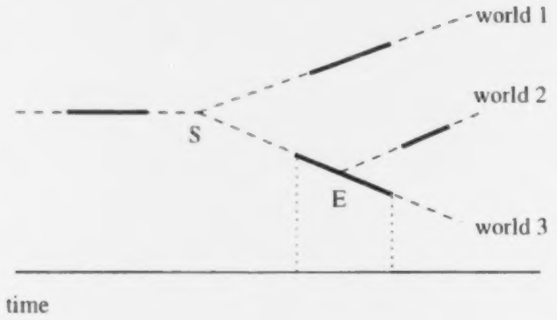

Figure 1: Possible worlds model

The two models are:

- futurity as a corollary of modality in a Kripke model of possible worlds (actually entire histories of possible worlds) as pictured in Figure 1. This theory is enriched by a notion of context dependence (Kratzer 1977, 1991). In this model, *will* is purely modal with the future being epiphenomenal.
- the modal-temporal model, where both future time reference and modality coexist as pictured in Figure 2. An argument for the notion of future temporal interpretation also has ramifications for ontological commitment in a theory of temporal knowledge representation, see Steedman (1996). In this model, *will* is ambiguous between receiving a modal and a future temporal interpretation.

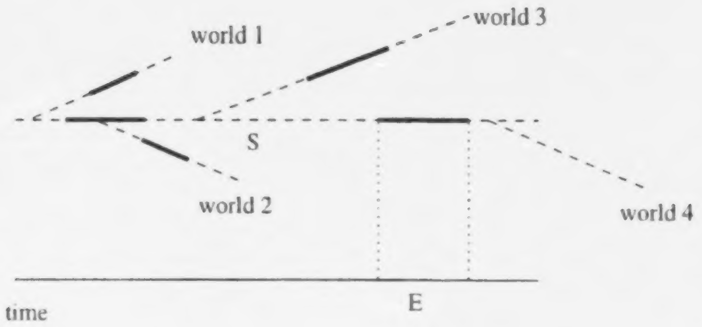

Figure 2: The modal-temporal model

Most of the discussion in the literature could be characterized as taking one of these two options in order to adequately describe the semantics of *will*.

Since several efforts at categorizing the nature of *will* are reviewed and compared here, and since many of these efforts do not share a common theoretical background, we have tried to remain theory-neutral throughout the following discussion.

4. The Data

As mentioned before, *will* is not uniquely used to refer to future time. *will* is also commonly used as a modal with reference to present or past time.

futurity

(4) a. Tomorrow morning I will wake up in this first-class hotel suite.
b. He will go to London tomorrow. (Boyd and Thorne 1969)
c. I'll be 21 next week. (Haegeman 1983)
d. Between 6 and 7 I'll be having my bath. *(duration)* (Haegeman 1983)
e. Well, I'll ring you tonight sometime. *(volition)* (Palmer 1986)
f. I will do it. *(volition)* (Haegeman 1983)
g. The queen will now hand the trophy to the captain. *(immediate future)* (Haegeman 1983)

epistemic modality

(5) a. That will be the milkman.
b. Tell him Professor Cressage is involved – he will know Professor Cressage. (Palmer 1979)

c. In the 1920s Wilkinson Sword introduced the stroppable razor and then the 'Empire' range which many people will remember. (Palmer 1979)

d. He will have read it yesterday. (Huddleston 1995)

dynamic modality

(6) a. John will get angry over nothing.
b. John will work one day and loaf the next.
c. Ed will lie in bed all day, reading trashy novels. (Huddleston 1995)

capability/generic

(7) a. Nitric acid will dissolve zinc. (Boyd and Thorne 1969)
b. Oil will float on water. (Haegeman 1983)
c. Accidents will happen. (Elvis Costello)
d. The French will be on holiday today. (Palmer 1979)
e. In 20 years, cockroaches will prey on humans.
f. According to predictions, typhoons will arise in this part of the Pacific.

directives

(8) a. You will do as I say, at once.
b. Will you please stop that racket?
c. You will report back for duty on Friday morning. (Huddleston 1995)

Of course, these examples do not exhaustively cover the various modalities that *will* can participate in[2]. Both Palmer (1979) and Haegeman (1983) attempt to give a more exhaustive list of contexts in which *will* can be used. For the purposes of this paper, we will simply try to distinguish the modal uses of *will* from its temporal use to refer to future time.[3]

5. Various Analyses of *Will*

There have been several first approximations towards giving a unified semantics for *will* (and such morphemes). Comrie (1989) refutes the conclusions drawn by such theories and we give a brief summarization of the arguments below:

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[2] As the examples show, modal uses of *will* like other modals are sensitive to context. Kratzer (1977, 1991), formalizes these contextual dependencies. We will return to this subject later when we discuss the temporal contribution of modals.

[3] We'll make a simplifying assumption and not look at *shall* in this paper. With respect to our study, *shall* does not differ from *will* in any significant way. *shall* has a sense of obligation in contrast with *will*, however it shows a similar ambiguity between a future and a modal present time interpretation (see Palmer 1979:62).

1. Since the future is inherently less certain, future time reference is different from present or past time reference, and is thus inevitably modal (Jespersen 1931, Lyons 1977, Yavaş 1982, Palmer 1979, 1986). However, statements about *next week* or *tomorrow* in examples like (9a) have more in common with past time reference in (9b) than the modality in (9c). Comrie (1989) calls this the "conceptual non-argument".

   (9) a. #It will rain tomorrow but it won't rain at all.
   b. #It had rained yesterday but it didn't rain at all.
   c. It must rain tomorrow but it might not rain at all.

   It should be noted that this leaves open the possibility that a particular language might subsume future time reference under modality, thus making overt the lower degree of certainty usually associated with statements about the future. This is the case in Burmese (Comrie 1985:50–51) where declarative sentences take either realis or irrealis particles. The irrealis particle subsumes possibility in the non-future, but also all future-time reference.

2. In terms of their syntactic distribution, the tokens *will* and *shall* are auxiliaries that distribute exactly with the modal auxiliaries. Hence they should have identical semantics (Palmer 1979, Coates 1983, Perkins 1983, Quirk et al. 1985). However this view is not tenable. Consider the determiner *a* which distributes identically with *the, many,* etc. Non-specific uses of *a* however are not considered to be quantifiers like other determiners in some semantic theories (e.g. those in the DRT vein). Comrie (1989) also argues against this view and calls it a "formal non-argument" and shows that if considered cross-linguistically such a premise is neither a necessary nor a sufficient condition on a description of the data.

3. Since most natural languages seem to have future tense morphology ambiguous with respect to future temporal interpretation and modality this is an indication of a language universal. First of all, as Comrie (1989) points out, according to Haiman's (1980) grammar of Hua, verb inflections in Hua are solely used for future time reference. They are not used to express modal values with present or past time reference. Even if all languages had ambiguous future tense morphology, this does not rule out true ambiguity as a result of the morphological resources available to a language.

With the inconclusive approaches out of the way, the remaining sections lay out some evidence that will help us choose an analysis for *will*.

6. Future ≠ Past

In this section we look at empirical evidence that attempts to show that future time reference is different from past time reference.

6.1. Present/Future Ambiguity

Zagona (1989) points out that while ambiguity between present or future interpretations of an event is always possible, such a "shifting" between past and present is not. The following examples are taken from Zagona (1989).

As the comparison in (10) and (11) shows, unlike morphologically present sentences, morphologically past sentences cannot be construed as contemporaneous with the utterance time (the *now* in (11) crucially has to refer to utterance time for ungrammaticality) or to some future time.

(10) a. *John sang now/tomorrow.
b. John is singing now/tomorrow.
(11) a. *John was singing now/tomorrow.
b. John sings now/tomorrow.

Also, non-past tense morphology does not admit a past adverbial as in (12). But, by contrast, non-past tense morphology can take future interpretation as in (13). Zagona (1989) also cites a similar ambiguity between past and non-past morphology in Spanish.

(12) a. *Plácido sings yesterday.
b. *Plácido is singing yesterday.
c. *Plácido will be singing yesterday.
(13) a. Juan sings tomorrow.
b. Juan is singing tomorrow.

Thus, past and non-past morphology do not behave alike when it comes to temporal modification.

6.2. The Perfect

In a Reichenbachian system, the past perfect is associated with the tense diagram `E-R-S`, where data such as (14) is explained by the fact that neither the `E` point nor the `R` point can be associated with the `S` point (Hornstein 1990).

(14) a. John had eaten the cake yesterday. (Hornstein 1990)
b. *John had left right now/at this very moment.
c. *John had left tomorrow.

The future perfect is given an analogous tense diagram: `S-E-R`. However, we can give the future perfect an interpretation where the `E` point can precede the `S` point (without invoking any modal behavior) as in (15). In order to analyze these cases, Hornstein (1990) gives the structure `(S-R) o (E-R)` to the future perfect and along with the future in past, `(R-S) o (R-E)`, it is the only tense diagram that does not compose to give a well-formed Reichenbachian tense diagram like the other tense diagrams do[4].

(15) John will have finished his manuscript by tomorrow. (see §7.4)

6.3. Sequence of Tense

Consider sentence (16): this sentence has two distinct readings, a "shifted reading" (Enç 1987) in which John hears at a past time that Mary was pregnant at a time previous to that. It also has a "simultaneous reading" (the so-called *sequence of tense* reading) in which John hears at a past time that Mary is pregnant at the time of hearing. These two readings occur in languages like English which is a strict *sequence of tense* language (Steedman 1996). See Enç (1987), Abusch (1988), Hornstein (1990), Ogihara (1995) for further discussion about this phenomenon.

(16) John heard that Mary was pregnant.

However, simultaneous readings are only available with stative complements as in (17) but not with eventive complements as in (18). The examples are from Enç (1987).

(17) a. You knew that I was upset about the results.
b. I heard that Sally was in London.
(18) a. John heard that Mary failed the test.
b. The gardener said that the roses died.
c. Sally thought that John drank the beer.

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[4] Also, the present perfect combines happily with stage level predicates but the future perfect does not:

(i) #He will have been available. *(future perfect reading)*
(ii) He has been available.

Further discussion on the future perfect is given in §7.4.

In the literature, the issue of whether sentences with *will* undergo sequence of tense phenomena has been debated. (Hornstein 1990) argues that *will* does participate in sequence of tense, i.e. in (19) the complement clause is predicted to be co-temporal with the main clause.

(19) Mary will say that she will be tired. (Enç 1996)

However, as Enç (1996) points out, Hornstein's (1990) theory also must predict that the sequence of tense rule is optional and hence in a sentence such as (20) there must exist a reading in which the S point of the embedded clause is left free, and by default is identified at the utterance time. On this reading, the time of thinking and the time of being pregnant are both claimed to be after the utterance time, but they are not ordered with respect to each other. Among the non-ordered readings, the reading where the pregnancy precedes John's thinking does not seem to be available.

(20) John will think that Mary will be pregnant. (Hornstein 1990)

6.4. Aspect

We will consider four tests used by Vendler: (a) compatibility with adverbials like *for 15 minutes,* (b) *in 15 minutes,* (c) the entailment arising from the progressive and (d) compatibility with the perfect (see Steedman 1996:6). We will only consider a category of events like *walking, climbing* and *writing* which Vendler called *activities* (as opposed to events which are *achievements* like *arriving, reaching the top* or *fishing* or events that are *accomplishments* like *writing a sonnet* or *flying to Paris*). Activities are extended in time and when the tense morphology is past, they can combine with *for*-adverbials but not with *in*-adverbials, that the progressive does carry a factive entailment, and that they are odd with the perfect. The following examples are from Steedman (1996:6).

(21) a. Keats wrote for 15 minutes.
b. #Keats wrote in 15 minutes.
c. Keats is writing. ($\models$ Keats will have written)
d. #Keats has written.

Now consider *activities* with *will* instead of the past tense morphology.

(22) a. Keats will write for 15 minutes.
b. Keats will write in 15 minutes.
c. Keats will be writing. ($\not\models$ Keats will have written)
d. Keats will have written.

The examples in (22) show that there are some aspectual difference in future time reference and past time reference.

6.5. Conclusion

There is empirical evidence to believe that the future can be distinguished in terms of temporal interpretation from the past.

7. The Future and Modality

In this section we look at the various arguments presented in the literature that attempts to show that the *will* used for futurity can be empirically shown to be different from the *will* of modality.

7.1. Passivisation

In Wekker (1976) and Davidson-Nielsen (1988) the effect of passivisation on *will*-sentences is taken to be a formal device that shows the distinction between *will* as a future tense auxiliary and the volitional or a modal *will*. The argument is as follows: the sentences in (23) (from Haegeman 1983) are synonymous in their future reading, however in their volitional reading, (23a) means that John is the unwilling party, while in (23b) it is Mary who is unwilling.

(23) a. John won't meet Mary.
b. Mary won't be met by John.

This distinction in meaning was surprising in the context of the relation between active and passive sentences in earlier transformational grammar. Of course, the fact that future *will* is voice-neutral and volitional *will* isn't cannot be a litmus test for tense and modality because:

- epistemic *will* is voice-neutral as shown in (24).

(24) a. John will have finished the job yesterday. (Haegeman 1983)
b. =The job will have been finished by John yesterday.

- and the voice-neutral future *will* in (25) patterns like the past tense morphology and the modal auxiliary *may*.

(25) a. The rain *delayed/may delay/will delay* the start. (Huddleston 1995)
b. =The start *was delayed/may be delayed/will be delayed* by the rain.

7.2. Conditionals

Wekker (1976), Davidson-Nielsen (1988) and Declerck and Depraetere (1995) distinguish the future tense auxiliary from the modal auxiliary by reference to the non-appearance of the future tense *will* in the antecedents of conditionals. This is simply not true, as evidenced by the sentences in (26).

(26) a. And I will greatly appreciate it if you will not tell your husband. (Brown corpus *cn19*)
b. "And I am not sure that I have any cash – any money , that is – but if you will wait just a minute I will write you out a check if I can find my checkbook. Won't you step into the living room , where it's cozier"? (Brown corpus *ck22*)
c. "I'll have a drink , then , if you'll have one with me".
"If you will promise to make it weak". (Brown corpus *ck22*)

7.3. Adverbial Modifiers and Free Choice *Any*

Hornstein (1990) argues that the future tense *will* in English can be easily distinguished from the modal *will* by some simple empirical tests.

The first involves the modification of the present-tense adverb such as *now.* The claim is in (30) (from Hornstein 1990:33) the modal *will*, but not the future tense *will* as in (29a), is modifiable by a present-tense modifier.

(27) a. That will be Max at the door now.

Accepting that this is true, let us take a case of a future tense *will* such as (29a). Compare it with the sentence in (29b). It seems that analogous to the argument given for *will, must* too is ambiguous between a sense compatible only with future-time modifiers like *tomorrow* and a sense compatible with a present-tense modifier like *now.* In fact, all the modals in (30a) seem to participate in this ambiguity. But Hornstein (1990) goes on to make crucial distinctions between modals like *must* which is assumed not to be ambiguous and *will* which is (see §7.4). Hence, sentences in (30) do not solve the problem of deciding whether *will* is ambiguous.

(28) a. George will leave now.
b. Suzie will go to sleep now.
(29) a. Tomorrow, John will leave for Paris in a week.
b. Tomorrow, John must leave for Paris in a week.
(30) a. John *could/should/might/may/can/must* go to school *now/tomorrow/ *yesterday.*

b. Go to school *now/tomorrow/ *yesterday.*

Hornstein (1990:202n38) also claims that free choice (FC) *any* can be used to detect modal uses of *will* from the temporal future sense. The contrast is given in (31) (from Hornstein 1990:202).

(31) a. Leave this instant on any available flight.
b. John will leave this very instant on any available flight.
c. *John left yesterday on any available flight.
d. You will leave tomorrow on any flight. (*directive*)
e. ??I simply believe that you will leave tomorrow on any flight.

The argument is that (31e) is odd because of a lack of directive force which is seen in (31d). Consider (32a) which has *will* in a complement clause where it is impossible to get imperatives in English. The use of FC *any* seems to be grammatical. Also the emphasized segment of the discourse in (32b) seems to me difficult to reconcile with an imperative use of *will*, but it clearly has a FC *any* under its scope.

(32) a. John told/assured me that Mary will catch any available flight tomorrow in order to reach the meeting on time.
b. "Information is hereby given that Mr. Timothy Palmer of Newburyport, Mass. has agreed to take charge of the concerns of the Patentees of the Chain Bridge, in the states of Massachusetts, New Hampshire, Vermont, Rhode Island, and Connecticut, so far as relates to the sale of Patent rights and the construction of Chain Bridges
"*Mr. Palmer will attend to any applications relating to bridges* and if desired will view the proposed site , and lay out and superintend the work, or recommend a suitable person to execute it.
John Templeman. "Approved, Timothy Palmer".
(Brown corpus *ce18*)

7.4. The Future Perfect

Hornstein (1990:38) cites the future perfect as evidence to support the view that the future tense acts quite differently from the modal *will*. The assumption is that in English the two senses of *will* have the Reichenbachian tense diagrams given in (33).

(33) a. future perfect *will have* := `S-E-R`
b. modal + have *will have* := `E,R-S`

The tense diagram for (33b) is that of the simple past. This tense diagram is shared with all other modals such as *must,* etc. but crucially Hornstein (1990) gives evidence to show that other modal verbs with *have* do not get the tense diagram for the future perfect in (33a). The reason is the contrast between the examples of modal verbs with *have* in (34) and the sentences with *will have* in (35) (taken from Hornstein 1990:39).

(34) a. John must have eaten at 3 pm.
b. John should have eaten at 3 pm.
c. At 3 pm, John must have eaten.
d. At 3 pm, John should have eaten.

(35) a. John will have left the office at 3 pm.
b. At 3 pm, John will have left the office.

The sentences in (35) can be interpreted with John's leaving occuring either at or before 3 pm (i.e. either modifying the E or the R point, Hornstein (1990) shows that sentence initial time adverbials tend to modify the R point easier than the E point). The sentences in (34) show no such ambiguity. This is striking evidence since this tries to show that *will have* has a R point which can be modified (which is distinct from the E point), and existence of a temporal R point is strong evidence that we are dealing with a tense interpretation of *will* rather than a modal one.

To verify this evidence, we should test whether the particular choice of modal has anything to do with the judgments seen in (34). Consider the examples in (36) and (37). They seem to allow modification of the R point more readily than the examples in (34).

(36) a. John might have eaten his lunch at 3 pm.
b. John may have eaten lunch at 3 pm.
c. At 3 pm, John might have eaten his lunch.
d. At 3 pm, John may have eaten his lunch.

(37) a. The train must have left by now.
b. The train may have left by now.
c. The train will have left by now.

Also, as seen in the sentences in (38) (if my judgments are correct) the modification of the R and the E point in *will have* sentences is not as robust as in the cases with *will*.

(38) a. Now we'll be broke at the end of the month.
b. ??At the end of the month, we will have been broke on the 15th.
c. Tomorrow, John will leave for Paris in week. (Hornstein 1990)

d. ??Day after tomorrow, John will have left for Paris at 3 pm tomorrow.

If Hornstein's (1990) story about *modal have* and *will have* sentences is not the right one, what could account for the data presented in this section. Consider the simplest answer: the underlying tense in all the *modal have* sentences including the *will have* sentences is the present perfect `E-S,R`. The range of adverbs that the present perfect can take in English is limited. As Hornstein (1990) points out it is odd to say "John has left yesterday".

If this simplistic analysis can be justified, then all modals always have present tense which combines with the perfect auxiliary *have* to give us the present perfect. The tense diagram of the present perfect allows us to explain the objection in Comrie (1985:71) (see Hornstein 1990:200n15) that (39) has an interpretation where `E` is prior to `S`. In order to analyze these cases, Hornstein (1990) gives the structure `(S-R) o (E-R)` to the future perfect and along with the future in past, `(R-S) o (R-E)`, it is the only tense diagram that does not compose to give a well-formed Reichenbachian tense diagram like the other tense diagrams do.

(39) John will have finished his manuscript by tomorrow. (Hornstein 1990)

Such an analysis also predicts why the sentences in (37) allows the modification of the `R` point by *now*. The interaction of modality with the present perfect (see §7.4) can be used to explain cases like (40) where the `R` point in a Reichenbachian tense diagram is not associated with the `E` point.

(40) a. If you remember how we were and how we lived, then we will have lived again.
b. By 1965, several or all of these systems will have been fully tested and their reliability established. (Brown corpus *ch21*)

7.5. Conclusion

This section reviewed the evidence presented in the literature to show that future tense and modality in English can be shown to be different. We saw that there seems to be no good argument *against* a unified treatment of *will* as a modal[5]. There is also evidence that diachronically *will* and *shall* have modal origins in English (Jespersen 1931, Comrie 1989, Haegeman 1983:39–40).

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[5] This section did not consider other less principled arguments put forward (citing evidence from negation, replacement by *shall* in indirect speech, alternation with *I think* and *probably* and combination with a simple present tag, like *does s/he?*) to show that the future *will* differs distributionally from the volitional or the modal *will*. See Haegeman (1983), Huddleston (1995) for counter-examples to these arguments.

8. The Modality of Prediction

Having shown in §7 that the futurity of *will* is not incompatible with a modal semantic interpretation let us look at some implementations of this idea.

Verbs that express desires or demands evaluate their complements in a future time relative to their own event time. According to Boyd and Thorne (1969), Palmer (1979),[6] Haegeman (1983) and Enç (1996), the futurity of *will* is a consequence of its interpretation as a modal of prediction and hence *will* can unambiguously be taken to be a modal.

According to this view the futurity in (41c) and (41d) is a consequence of the modality of *will* analogous to the futurity in (41a) and (41b) being a consequence of the lexical semantics of the verbs *expect* and *want*.

(41) a. I expect to win the race. (Enç 1996)
b. "He wants me to go with him tomorrow", she told Kate. (Brown corpus *ck15*)
c. I will win the race.
d. "That critter will be back tomorrow", predicted George Rust, "and he'll bring fifty of his kind back with him. Blue Throat won't stand for this. He'll shoot up the town". (Brown corpus *cn26*)

However this cannot be an adequate theory if *will* is the only modal that displays futurity due to the modality of prediction. Enç (1996) gives the examples in (42) to show that other forms of modality show the same effect of futurity. (42a) and (42b) are examples of deontic modality[7] and (42c) is an imperative[8].

(42) a. You must do fifty push-ups. (Enç 1996)
b. Sally may go to the party if she finishes her work. (Enç 1996)
c. Do fifty push-ups. (Enç 1996)

The time of doing push-ups in (42a) and (42c) and the time of going to the party in (42b) are required to be after the utterance time. However, the futurity is not conclusively the result of the intensional expressions in the above examples. For instance, the sentences in (43) are identical to the sentences in (42) except that the intensional expressions are replaced with some appropriate context to elicit a reading in which the time of doing push-ups and the time of going to the party are after the utterance time (analogous to (42)). The sentence in (45) is the real-life counterpart of the constructed examples in (43). As (43b) shows, the prediction of *will* is not at the utterance time. Rather, the prediction holds at a time specified by the *when* clause. The examples in (43) and (45) give evidence against Enç's (1996) implicit assumption that English does not have any present tense interpretation that cannot be collapsed to the utterance time, and a sentence like "John must leave." does not project tense (Enç 1996:354).

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[6] No specific proposal is made (see Palmer 1979:11).

[7] Deontic modality denotes the feasibility and permissibility of the core proposition, and ability and obligation of the agent (see Palmer 1986).

[8] This example is relevant under the assumption that imperatives have an intensional expression associated with their semantics.

(43) a. You do fifty push-ups and I'll give you your money.
b. When you do fifty push-ups, I'll give you your money.
c. Sally goes to the party only if she finishes her work.
(44) a. You'll do fifty push-ups and I'll give you your money.
b. When you'll do fifty push-ups, I'll give you your money.
c. Sally will go to the party only if she will finish her work.

(45) But come the next session of Congress, State can expect only that its summer guest will bite its hand *when it goes to the Capitol asking money for diplomatic entertaining expenses abroad* or for living expenses for its diplomats. (Brown corpus *cf46*)

The futurity in the present tense sentences (43) and (45) could be claimed to be derived from an implicit *will* present in those sentences (as explicitly shown in (44)). We will show in §9 that this cannot be true.

Note that all we are arguing for here is that while *will* can be treated as a modal of prediction, it does not always have the utterance time as its reference point.

The examples in (43) also show why the analysis in Boyd and Thorne (1969) leads to difficulties. Boyd and Thorne (1969) attempt to give an analysis of modals using the notion of a speech act. They see the difference between the sentences in (46) as reflected in their illocutionary force as characterized by the sentences in (47).

(46) a. He goes to London tomorrow.
b. He will go to London tomorrow.
(47) a. I state He goes to London tomorrow.
b. I predict He goes to London tomorrow.
(48) a. He will go to London now/tomorrow.
b. I predict He goes to London now/tomorrow.

c. I direct He goes to London now/tomorrow.

However, this approach does not explain the temporal interactions of the various illocutionary uses of *will*. For example, in (48) the illocutionary forces of a *prediction* and a *directive* can both be interpreted at utterance or future time (see (49c) for a more convincing example of the temporal interpretation of (48b) as the utterance time). Palmer (1979) also points out other problems with this approach.

Modals like *must* and *may* also have interpretations where no shift to future time takes place. This is also true of *will*. It is important to note that examples (49a) and (49b) although predicated of the present time are cases of deontic modality, while (49c) although predicated of the present time is, however, a case of prediction.

(49) a. Sally *must* be in her office now. (Enç 1996).
b. Go home, your mother *may* be worried.
c. Go home, your mother *will* be worried.
d. Sally will be in her office now.

Until the precise nature of the temporal contribution of modals is resolved the analysis of the futurity of *will* being derived from the modality of prediction cannot be conclusive. We will return to the notion of the temporal nature of modality in §11.

Haegeman's (1983) analysis of *will* is one in which it is neither exclusively a modal nor tense morphology, rather it is given a more general meaning from which both its interaction with tense and modality is predicted based on contextual and epistemic facts about the discourse. The particular lexical meaning given to *will* is as follows (from Haegeman 1983:162):

1. non-factuality, i.e. time-based objective uncertainty
2. actuality, speaker-based subjective certainty
3. event-time orientation

Haegeman (1983) tries to provide *will* with one basic contribution towards a discourse model, with a wide range of contextually and situationally defined specifications which express under which conditions in a discourse which particular sense of *will* is appropriate. However, the crucial point of future time reference is resolved via ascribing to the basic meaning of *will* the ability to shift the event time (see (3)). While the basic meaning attributed to *will* is that of a modal of prediction ("a modal of conditionality indicating maximal likelihood"), the analysis presupposes an *intention* towards future-time specification in order to distinguish the future from the modal.

Enç (1996) gives a reasonable answer within possible world semantics to the temporal contribution of modals. The assumption is that possibility and necessity is over world-time pairs. You could equivalently assume that quantification is over entire histories of possible worlds (as in Figure 1). The interpretation given to modals that refer to future time is given in (50).

(50) MODAL[S] is true at $\langle w, i \rangle$ iff in every world w' accessible to w there is an interval i' such that $i < i'$ and S is true at $\langle w', i' \rangle$. (Enç 1996)

Here, *will* is considered one of the modals that can be interpreted by (50), and the futurity is derived due to the fact that the worlds are ordered as histories. Crucially, there is a particular sense of *will* that has an interpretation as in (50). The *will* that is used, say, in *John will leave*. However, there is also the *will* that is used in *Sally will be in her office now* which will get an interpretation that is given by (51) (as far as we can tell, the epistemic *will* with *now* does not *have* to be evaluated with respect to the current world). Notice that this interpretation is still consistent with considering *will* as a modal of prediction.

(51) MODAL[S] is true at $\langle w, i \rangle$ iff in every world w' accessible to w there is an interval i' such that $i = i'$ and S is true at $\langle w', i' \rangle$.

Considering the interpretation available to the epistemic *will* in *John will have left yesterday*, yet another interpretation has to be made available, namely the one in (52) (assuming that the R temporal point for the perfect can be handled appropriately in some compositional way).

(52) MODAL[S] is true at $\langle w, i \rangle$ iff in every world w' accessible to w there is an interval i' such that $i > i'$ and S is true at $\langle w', i' \rangle$.

Hence, such a view has to derive all the possible temporal interpretations of the modal *will* via ambiguous models.

We will come back to the notion of *will* as a modality of prediction in §11.

9. The Futurate

In many cases (cf. §8), the reference to future time in sentences containing *will* is compared to what is termed as the futurate construction (Smith 1983), e.g. (53).

(53) Tomorrow, the Yankees play the Red Sox. (Vetter 1973)

An argument can be made (as in Lakoff 1971) that this evidence is not relevant since one can hypothesize an implicit *will* in sentences like (53) hence explaining why they refer to a future time. However, as (Vetter 1973) points out using the examples in (54), the futurate behaves differently from sentences with an explicit *will* in many contexts.

(54) a. Tomorrow, the Yankees will play well.
b. #Tomorrow, the Yankees play well.
c. Tomorrow, the astronauts will splash down safely.
d. #Tomorrow, the astronauts splash down safely.
e. The Yankees will have played the Red Sox next Thursday.
f. #The Yankees have/had played the Red Sox next Thursday.

This tells us two things:

- An analysis of the futurate construction cannot be collapsed to that of *will*.
- Reference to future time is not uniform. The futurity of *will* is somehow distinct from the futurity displayed in the futurate construction.

Some consider the simple present tense in sentences like (54) to be the "true" future tense in English (Steedman 1996), while others like Vetter (1973), Huddleston (1977), Smith (1983) consider the futurate to be formally in the present and making a modal statement (a schedule or plan) about the current time[9].

Steedman (1996) (citing Isard and Longuet-Higgins 1973) points out that the past tense demands that its past reference point (the R point) be explicitly established, either by a modifier, such as a *when* clause, or by preceding discourse. Thus (55a) is inappropriate as the first utterance of a discourse (except under cases where a temporal reference is *accommodated*), while (55b) is fine.

(55) a. #Chapman breathed a sigh of relief. (Steedman 1996)
b. When Nixon was elected, Chapman breathed a sigh of relief.

The futurate too, is anaphoric, like the past with the same need for an "anchored" reference point. Hence, (56a) is inappropriate when discourse-initial, whereas the suitably anchored (56b) is fine. Steedman (1996) gives this as evidence that the present tense morphology (or the pure future tense interpretation) is a true tense since it behaves analogous to the past tense. Given the evidence in (56a) and (56b) an explanation of the present tense morphology as being under-specified with respect to temporal interpretation might be a better alternative. This can also help us explain cases of the "dramatic present" (also called the historic present) in (57) where the present tense is bound in some discourse by a past tense (sometimes immediate past) interpretation.

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[9] Also Binnick (1971, 1972), Palmer (1979), Haegeman (1989) give evidence to support the view that other "periphrastic futures" in English such as *be to, be about to, be going to* are also modal in character.

(56) a. #Harry moves to Philadelphia. (Steedman 1996)
b. Next Tuesday, Harry moves to Philadelphia.

(57) But Voltaire perseveres. He goes to the chief himself. "At what university did you study"? He asks. He refuses to believe that the bandit chief never attended a higher institution. "To have become so corrupt", he says, "surely you must have studied many arts and sciences". *(dramatic present)* (Brown corpus *ck08*)

We shall see in §11 that *will* too shows anaphoricity but of a somewhat more complicated nature.

10. The Evidence from *Would*

Certain syntax-semantic reasons have been given to show that *would* is synchronically related to *will*, i.e. *would* = *woll* + PAST[10]

Recall the discussion of sequence of tense from §6.3. Now consider the view that *would* = *woll* + PAST. Then embedded clauses in past tense with *would* in the matrix clause should also show sequence of tense effects. Both Abusch (1988) and Ogihara (1995) argue that this is true. The argument is that sequence of tense in English ensures that for a clause to be co-temporal with its complement clause which has past tense morphology, the clause itself has to carry past tense morphology. For instance, in (58a) John's talk with his mother is co-temporal with their meal together and in (58b) the time of saying is the same as the time the predicate "Stalin and Molotov being less reliable defenders of Russia" holds.

(58) a. John decided a week ago that in ten days at breakfast he *would* say to his mother that they *were* having their last meal together. (Abusch 1988)
b. The White Russians and the Ukrainians *would* say that Stalin and Molotov *were* far less reliable defenders of Russia than Curzon and Clemenceau. (Brown corpus *cj36*)

Replacing *would* with *will* in (59) only gives the shifted reading[11] (see Ogihara 1995).

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[10] PAST indicates past tense morphology. Note that this conclusion is not as obvious as it seems. Hornstein (1990) for instance, does not give *would* such a representation.

[11] The judgment is from Ogihara (1995). Some speakers seem to get the co-temporal

(59) a. John decided a week ago that in ten days at breakfast he *will* say to his mother that they *were* having their last meal together. (Ogihara 1995)

b. The White Russians and the Ukrainians *will* say that Stalin and Molotov *were* far less reliable defenders of Russia than Curzon and Clemenceau.

Also, the co-temporal reading vanishes when the complement clause is an event as in (60) where only the shifted reading is available. Thus (given that the above judgments are valid) clauses with *would* pattern with other clauses with a morphological past tense with respect to sequence of tense phenomena.

(60) a. Few months' later, John would hear that Mary failed the test.

b. Few months' later, the gardener would say that the roses died.

c. Sally would think that John drank the beer.

There are, however, cases where *would* in an embedded clause can be modified by future adverbials and are not co-temporal with the higher clause as in (61a). But ordinary past tense morphology also shows this behavior as shown in (61b).

(61) a. Phoebe didn't realize that the Yankees would play the Red Sox the next day (so she agreed to fly to Mauritius with Henry Kissinger).

b. Phoebe didn't realize that the Yankees played the Red Sox the next day. (Vetter 1973)

It is important to note that we have not made any commitment towards a particular interpretation for the PAST tense morphology. However, a unified interpretation might be given for cases where *would* can take on a modal interpretation as in (62) where a counterfactual reading is obtained. This can be summarily explained by referring to the theories which have linked the morphological past tense to the modality of counterfactuals (Isard and Longuet-Higgins 1973, Isard 1974, Iatridou 1996). [12]

(62) Mary would have finished the book.

Also, Huddleston (1995) gives the following examples (63) and (64) to show the temporal contrast of *would* with *will*. These examples can be explained easily if *would* has a morphological past tense but are problematic for theories

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reading in (59a), but get only the shifted reading in (59b). Perhaps the higher verb *decided* is to blame, although this would be unexpected given that sequence of tense is considered to be local in nature (Hornstein 1990, Enç 1987).

[12] Also see the discussion in Palmer (1986:200–215).

that treat *would* as being systematically ambiguous (as in Hornstein 1990).

(63) a. I have no money on me but he won't lend me any. *(volitional)*
b. I had no money on me but he wouldn't lend me any. *(volitional)*
c. In a few months' time their love will change to hate.
d. Only a few months' later their love would change to hate. *(past reference time)*

(64) a. It will rain before we get home.
b. You said it would/*will rain before we got home.

Hence, there seems to be good evidence to show that *would* = *woll* + PAST tense morphology.

11. Thesis

In previous sections we have laid out a fairly comprehensive survey of the various viewpoints and related empirical facts cited in the literature on what semantics should be assigned to *will.* We also explored some additional facts such as the futurate and the use of *would* which were related to the use of *will.* In this section, we see if we have enough evidence to answer the question that was posed at the beginning of the paper: Is *will* part of the tense system or the modal system or is it simply homonymous?

First, let us encapsulate the conclusions from the previous sections:

- Future temporal interpretation in sentences with *will* have distinct effects on temporal modifiers, aspectual markers and sequence of tense when compared with past temporal interpretations.
- There was no convincing argument against the treatment of *will* as a modal.
- While *will* can be suitably treated as a modal of prediction, the prediction does not always have the utterance time as the reference point.
- *would* can be thought of as a modality of prediction plus PAST tense morphology.

After reviewing several arguments presented for and against the two sides of this question, we are led to the conclusion that the question is ill-posed since neither alternative alone could account for the empirical facts. However, there are some additional facts considered here which might shed some new light on the problem.

- We have seen in §9 that the PRES tense morphology can take various temporal interpretations,
- The arguments presented in §7.4 can be used to justify *will have* as having the present perfect as a temporal interpretation,
- The PRES tense morphology can also be bound by a generic operator, giving us the future generics in (7).

This leads us to the conclusion that a semantics for *will* can be always decomposed into a composition of the semantics given to a modal contribution and the temporal contribution of the PRES tense. It is important to note that both of these components can contribute to the temporal interpretation of *will*. Hence, the semantics for *will* is not exclusively modal as argued by one camp, neither is it ambiguous between a tense and a modal as argued by the other camp, but rather each instance of *will* seems to be simultaneously a modal and a tense morpheme. That is, *will* equals the modality of prediction plus PRES tense morphology.[13]

This is implicit in the various analyses in §10. Let us take *would* to be *woll* + PAST and analogously *will* to be *woll* + PRES (borrowing the notation from Abusch 1988).

But given that both the modal and the temporal parts of *will* can be anaphoric in nature, it would mean that *will* can be anaphoric in two dimensions simultaneously. Is this property empirically observed? The remainder of this section will attempt to show that such a property for *will* has been attested.

As Binnick (1972) points out sentences with *will* that are out of context seem elliptical Sentences such as the ones in (65) require some context to be felicitous.

(65) a. The rock'll fall. (Binnick 1972)
b. In fact, she'll die.

(66) is not elliptical in the same way.

(66) The rock'll fall if you pull the wedge out from under it. (Binnick 1972)

There are two kinds of anaphoric reference being considered here. The first is exemplified by the sentence in (67).

(67) Don't pull the wedge out from under that boulder, you nitwit! The rock'll fall. (Binnick 1972)

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[13] The distinction between futurity in *will* and that in the futurate is now explicit. Whereas in the futurate only PRES tense morphology exists, in *will* there is both the modality of prediction and the existence of PRES tense morphology.

The *will* in (67) is making reference to an *argument* (in the sense of Stone 1994), where in this case *will* has an epistemic meaning. It is important to note that in (67) *will* is not necessarily temporally bound to a future time.

In conditionals, this also explains why *will* can shift into the future twice as in (68). The fact that Tommy cries or Eric drops out of school is a *consequence* of the antecedent in both the conditionals in (68) and hence in those worlds where Sally wins the race, Tommy's crying is *predicted* to hold at those worlds.

(68) a. If Sally wins the race, Tommy will cry. (Enç 1996)
b. If Eric fails the test, he must drop out of school.

The other kind of anaphoric reference is when the PRES tense morphology in *will* gets its temporal interpretation from discourse (see Partee (1973), Muskens (1995, 1996) for other forms of temporal anaphora in discourse) shown in the examples in (69) via a co-indexation between the PRES tense in *will* and the location in discourse where the temporal interpretation is located.

(69) a. When the sun sets$_i$, we'll$_i$ be frozen. (Binnick 1972)
b. Someday$_i$ Americans will$_i$ be able to visit Albania.
c. Now$_i$ Salomé will$_i$ do her world-famous Dance of the Seven Ostrich Feathers.

Any semantic analysis of *will* must account for these two cases of anaphoric reference.

This analysis also extends to account for *would* as pointed out in Stone (1996), when we take *would* to be *woll* + PAST tense morphology which was argued for in §10.

(70) a. Only a few months later their love would change to hate.
b. My neighbours would kill me. (Stone 1996)

As sentences such as (63d) repeated as (70a) show, the temporal reference point for *would* is strongly anaphoric. This patterns with the anaphoric modal uses of *would* (Stone 1996) in (70b) uttered while looking at a high-end stereo in an electronics store. The anaphoric (or accomodated) context is one in which the speaker bought the stereo and played it at its natural volume. Analogous to this, the PAST tense morphology of *would* in (63d) makes anaphoric reference to a past temporal point where two people are in love, with respect to which love changes to hate in the future (a few months' later).

12. Conclusion

In this paper, we began with the following question: Is *will* part of the tense system or the modal system or is it simply homonymous? After reviewing several arguments presented for and against the two sides of this question, we were lead to the conclusion that the question was ill-posed since neither alternative alone could account for the empirical facts. Any semantics for *will* must account for a simultaneous contribution from the modal as well as the tense system. Note that this is distinct from stating that *will* is ambiguous between a modal and a future tense. In comparison to existing analyses, by increasing the dependence on contextual information a much simpler account for the semantics of *will* can be afforded.

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Predemonstrative Modifiers in Mandarin[1,2]

Alexander Williams

1. Introduction

The Mandarin demonstrative phrases (1) and (2) differ minimally in string order. The modifier *huangse-de* 'yellow' follows the demonstrative determiner in (1) and precedes it in (2). The phrases differ significantly in their presuppositions, however. As I show in Section 3, (2) presupposes that the universe of discourse contains only one yellow dog (Chao 1968, Wu 1994). (1), on the other hand, may be felicitous in a universe of many yellow dogs, providing that the speaker manages to direct the hearer's attention to a subset of the universe in which there is only one—by pointing, for example. I reflect this difference in the choice of English glosses. (2) has the broad, domain-general uniqueness presupposition of the English definite. The cardinality presupposition of (1) is relativized by context, as is typical of English demonstrative phrases as well.

(1) nei-zhi huangse-de gou
DEM-CLS yellow-DE dog[3]
'that yellow dog'

(2) huangse-de nei-zhi gou
yellow-DE DEM-CLS dog
'the yellow dog'

The goal of this paper is to derive these differences in meaning compositionally from those in string order, without attributing to constructions like

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[1] Portions of this work were presented at CLS 34 (Chicago, April 1998), and may be included in its proceedings. A reduced version is also in review for the proceedings of *On the Formal Way to Chinese Languages* (Irvine, December 1997).

[2] Thanks go to Robin Clark for his patient help; to Tony Kroch, Ellen Prince and Audrey Li for early comments; to Chunghye Han and Rajesh Bhatt for discussion; to Yuan Xiao, Minmin Liang, Fudong Chiou, Yuan Sun and again Audrey Li for judgments; and to the reviewers and editors of this series. The mistakes are mine.

[3] 'CLS' stands for 'classifier.' The particle *de* intercedes between modifiers and the noun modified. Other grammatical morphemes that will not be glossed are the coverb *ba*, the perfective *le* and the sentence final pragmatic particle *le*.

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(2) any semantic or pragmatic characteristics not robustly evidenced in natural data. I argue in Section 4 that previous interpretations of the contrast between (1) and (2) (Chao 1968, Huang 1983, Wu 1994, inter alia) have failed to do this.

My explanation arises from a simple observation: demonstratives have a characteristic sensitivity to context. Apparently, the demonstrative determiner denotes a function not saturated by the common noun phrase (NBAR) to its right alone. We can assume it includes a variable not instantiated by NBAR, typically left open to context. I demonstrate in 5.1 that, when there is a predemonstrative modifier, it instantiates exactly this context variable. Phrases like (2) are thereby shut off to context, and acquire a broad uniqueness presupposition. 5.2 formalizes these ideas, and 5.4 discusses the syntax of the formalization. The resultant theory is attractively minimal: it invokes no machinery not forced by the semantics of demonstratives generally. It is also elegantly compositional, something no previous theory can comfortably claim to be. Moreover, its central claim—that the semantic context variable of demonstratives is realized syntactically in Mandarin—proves stimulating from a general theoretical perspective. Finally, the theory has promising extensions. In Section 6, I sketch a projection of the theory to certain sentential topic constructions, thereby unifying our understanding of the mapping between syntax and semantics in Mandarin. Finally, I suggest a generalization of the account to handle indefinites with predeterminer modifiers.

2. Descriptive Conventions

The basic Mandarin demonstrative phrase has the form DEM + NUMERAL + CLASSIFIER + NBAR. NBAR terminates with the head noun at the right edge, and may include a sequence of preceding modifiers following the determiner. The category 'modifier' includes adjectives, relative clauses, and prepositional phrases, as well as possessive and locative noun phrases. When NUMERAL is not overtly present, it is understood that NUMERAL=1. (The determiner *nei* in (1) and (2) was originally a contraction of *na* 'that' and *yi* 'one'.) I will refer to the substring DEM-NUMERAL-CLASSIFIER as DEM_n, where the subscript indicates the value of NUMERAL. DEM_n, I assume, names a function taking NBAR as an argument. (1) is a typical demonstrative phrase. For (1), DEM_1=*nei zhi* 'that (one)' and NBAR=*huang-de gou* 'yellow dog.' Such phrases, where no modifier precedes the determiner, I will call *DemPs*.

(2) exemplifies a variant type of demonstrative phrase, wherein a modifier does precede the determiner. Schematically: MOD + DEM + NUMERAL +

CLASSIFIER + NBAR. In this structure as in the canonical structure, NBAR may still include further modifiers, but I will only designate a predemonstrative modifier as MOD. Thus in (2) MOD=*huang-de* 'yellow,' DEM$_1$=*nei zhi* 'that (one)' and NBAR=*gou* 'dog.' Demonstrative phrases with an initial modifier, like (2), I will call *MDemPs*. (3)–(5) are further examples of MDemPs.

(3) gebi-de nei-zhi gou
neighboring-DE DEM$_1$ dog
'the dog next door'
(from Gundel et al. 1993)

(4) wo yuanlai ding -de nei-ge piao
I originally book -DE DEM$_1$ ticket
'the ticket I originally booked'
(*Callhome Mandarin*, 1430)

(5) shangci shuicao huaile, ba ta xiuhao -de nei-ge jiahuo
last-time sink broke BA he fix -DE DEM$_1$ fellow
'The guy who fixed my sink last time it broke.'

I motivate these glosses in Section 3.

One basic semantical assumption must be put forward immediately. In this paper, I take predemonstrative MOD, like NBAR, to denote uniformly in <e,t>; that is, to denote a first-order one-place predicate. Hence I should have to include in my semantics a rule which composes modifiers and common nouns by set-intersection, in addition to the rule of functional application (as in Heim & Kratzer 1998, e.g.). This assumption will not always be unproblematic, but it is defensible. I briefly address some problems in Section 5.3.

3. Describing the Differences between (1) and (2)

3.1. DemPs Have a Relative Cardinality Presupposition

Dem(onstrative-)phrases have a charactericstic openness to context. They range only over a subset of the available discourse referents, where the restriction to that subset is effected by some feature of the utterance situation (Kaplan 1977). Blunt examples show the domain restricted by a pointing finger or a directed gaze. This restriction can be strictly local to each individual dem-phrase. Uttering (6), I may wave first towards the fountain and then towards the tree, thereby designating distinct local domains with respect to which each dem-phrase is evaluated.

(6) That yellow dog and that yellow dog should be kept separate.

Contrast definite descriptions. (7), in the general case, is bad.[4]

(7) # The yellow dog and the yellow dog should be kept separate.

Presumably, when (7) is bad, it is so because the uniqueness presupposition of each description must be cashed against the same set of referents, and this is impossible, since there can only be a unique yellow dog in that set once. Call this set, with respect to which the presuppositions of a definite description are resolved, U, for *universe of discourse*.[5]

We can now state the presuppositions of a dem-phrase more clearly. A dem-phrase does carry a cardinality presupposition (an assumption that precisely N members of some domain have some property), much as a definite description does. But, while the presupposition of a description is evaluated against all of U, that of a dem-phrase is relativized to a subset thereof, where restriction to that subset is effected by context. Thus the first conjunct of (6) presupposes a unique yellow dog, but only in the set of things by the fountain. Equivalently, we could say it presupposes a unique dog by the fountain in U. (I will switch between these two ways of speaking casually, as for current purposes they are logically interchangeable.) Either way, reference fails if the fountain is patrolled by any more or less than one yellow dog. For ease of reference, call the contextually defined subset of U over which a dem-phrase D_x ranges U/D_x, and call a cardinality presupposition which is relativized to a subset of U a *relative* cardinality presupposition.

Mandarin DemPs like (1) typically behave like English dem-phrases. Consider (8), wherein two tokens of the DemP are conjoined.

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[4] I am idealizing. As pointed out in Westerståhl 1989, sentences like *The linguist voted for a linguist* can be felicitous—e.g., when it is known that the electorate and the candidate pool each contain one linguist. What is important here for present expository purposes is the general contrast between (6) and (7).

[5] The universe may be affected as discourse (and semantic evaluation) proceeds, but, at least within a single coherent monologue, only monotonically.

(8) nei-zhi huangse-de gou he nei-zhi huangse-de gou
DEM$_1$ yellow-DE dog and DEM$_1$ yellow-DE dog
(points towards the tree) (points towards the fountain)
dou tai ke'ai le.
both too cute LE
'That yellow dog and that yellow dog are just too cute.'

In (8), the first DemP ranges over that subset of entities in U which are by the tree ($U/D_1=\{x \mid x \text{ is by the tree}\}$).[6] It is felicitous only if by the tree there is exactly one yellow dog. A crowd of yellow dogs by the tree, and reference will fail. The second DemP ranges over $U/D_2=\{y \mid y \text{ is by the fountain}\}$. It is felicitous only if by the fountain there is one yellow dog, and no more.

The felicity condition on the use of DemPs is consequently as in (9), or equivalently as in (10). The same conditions hold for English dem-phrases.

(9) A DemP is felicitous only if:
in $U/D \subseteq U$, $|[\![\textsc{Nbar}]\!]| = \textsc{Numeral}$.[7]

(10) A DemP is felicitous only if:
$|U/D \cap [\![\textsc{Nbar}]\!]| = \textsc{Numeral}$.

In the case of (1), this means: $|U/D \cap ([\![\mathit{yellow}]\!] \cap [\![\mathit{dog}]\!])| = 1$.

3.2. MDemPs Have a Universal Cardinality Presupposition

The cardinality presupposition of an MDemP, like that of an English definite description, is *universal*. That is, an MDemP refers felicitously only if U in its entirety contains exactly NUMERAL (=n) things satisfying MOD and NBAR, as argued in Wu 1994 and first suggested in Chao 1968.

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[6] Notice that this predicate itself contains a referential term (*the tree*) which will not denote uniquely without indexical specification. For discussion of the logical problems surrounding the semantic 'completion' of referential terms see Soames 1986, and the references therein.

[7] $[\![X]\!]$ will mean the semantic evaluation of X: $[\![\mathit{yellow}]\!]$ is the set of yellow things in U. I will not distinguish between X and the translation of X: *yellow* stands for either an English word, or the function $\lambda x.\mathit{yellow}(x)$. Context should disambiguate.

(11) An MDemP in S is felicitous only if, in U:

$$|[\![\textsc{Mod}]\!] \cap [\![\textsc{Nbar}]\!]| = \textsc{Numeral}.$$

In (2), NUMERAL=1, MOD='yellow', and NBAR='dog'. (2) works out only if, in U, $|[\![\textit{yellow}]\!] \cap [\![\textit{dog}]\!]| = 1$. In other words, only if U contains exactly one yellow dog.

I take these conclusions to follow from (12) and (13). In both sentences, the first noun phrase is the MDemP (2).

(12) # huangse-de nei-zhi gou he huangse-de nei-zhi gou
yellow-DE DEM_1 dog and yellow-DE DEM_1 dog
dou tai ke'ai le
both too cute LE
# 'The yellow dog and the yellow dog are just too cute.'

(13) # huangse-de nei-zhi gou he nei-zhi huangse-de gou
yellow-DE DEM_1 dog and DEM_1 yellow-DE dog
dou tai ke'ai le
both too cute LE
# 'The yellow dog and that yellow dog are just too cute.'

The first conjunct in (12) and (13) refers to a yellow dog. In neither case can it be followed, without perversity, by a noun phrase referring to a second yellow dog. The English definite description ***the yellow dog*** imposes the same requirement, as demonstrated by the parallel infelicity of the glosses. The infelicity of the Mandarin sentences can be explained just as we would that of their glosses. If MDemPs carry the presupposition given in (11), then (2) presupposes a unique yellow dog in U, and therefore cannot innocently be followed by mention of a second yellow dog. I conclude that MDemPs carry a universal cardinality presupposition. When NUMERAL=1, the MDemP has a universal uniqueness presupposition.

Prosodic emphasis and ostensive gestures will not cancel the presupposition of the MDemP. Speakers judge (14) infelicitous, like (12), despite stress on either or both of the medial determiners, and even if each conjunct is accompanied by the kind of pointing gestures that make (8) felicitous.

(14) # huangse-de NEI-zhi gou he huangse-de NEI-zhi gou
yellow-DE DEM$_1$ dog and yellow-DE DEM$_1$ dog
dou tai ke'ai le
both too cute LE
# 'THE yellow dog and THE yellow dog are just too cute.'

Things *may* improve slightly—judgments are obscure—if the second NP is a very strongly stressed DemP. (15) is (8) with stress on the second conjunct.

(15) ?? huangse-de nei-zhi gou he NEI-zhi huangse-de gou
yellow-DE DEM$_1$ dog and DEM$_1$ yellow-DE dog
dou tai ke'ai le
both too cute LE
?? 'The yellow dog and *THAT* yellow dog are just too cute.'

However, that (15) is not atrocious in either language does not mean that *huangse-de nei-zhi gou* and *the yellow dog* do not presuppose a unique yellow dog. It simply shows that listeners are willing to accommodate updates to and corrections of what had been presupposed at the outset. Emphatic stress in (15) signals precisely an update of—an addition to—the domain, at that point in the discourse. Similar updates can be performed as in (16).

(16) The white cat and this other white cat slept on my chest.

The mitigated infelicity of (15) no more argues against (11), therefore, than it destroys our understanding of definite descriptions. What it demonstrates clearly is just that no diagnostic for presuppositions can be ideal, given our indulgent capacity for accommodation.

Thus (11) remains a well supported hypothesis: MDemPs have the universal cardinality presupposition of a definite description.

It should be noted that *unlike* descriptions, MDemPs cannot be used attributively Both MDemPs and DemPs have only directly referential readings (Donnellan 1966, Kaplan 1977, Kripke 1977). The subjects of (17) and (18) will contribute a particular individual to the propositional content. These sentences say about some particular linguistics teacher, indicated upon utterance, that he is always drunk. They cannot mean that, always, any person who teaches linguistics is drunk. The same is true for (19). But (20) can have this latter, attributive meaning.

(17) nei-ge yuyanxi-de laoshi zong shi zui-de
DEM$_1$ linguistics-DE teacher always is drunk
'That linguistics teacher is always drunk.'

(18) yuyanxi-de nei-ge laoshi zong shi zui-de
linguistics-DE DEM$_1$ teacher always is drunk
'The linguistics teacher is always drunk.' (on the referential reading.)

(19) That linguistics teacher is always drunk.

(20) The linguistics teacher is always drunk.

3.3. The Discourse-Pragmatics of MDemPs

Williams 1997 gives a foundation for an objective pragmatic theory of MDemPs. The purpose of this study was to determine the discourse conditions in which MDemPs are used, and to compare these to those of bare NBAR definites (BNDs), like (21).

(21) huangse-de gou
yellow-DE dog
'the yellow dog'[8]

The comparison was to BNDs, not DemPs, since BNDs carry a universal cardinality presupposition; their contribution to truth-conditional meaning thus differs minimally from that of MDemPs. Given this, the question arises, in what situations is an MDemP used, rather than the semantically very similar BND?

Roughly four hours of free conversation, text and sound, between (twenty-three) pairs of native Mandarin speakers were studied. The source was the Linguistic Data Consortium's *Callhome Mandarin* corpus. MDemP and BND tokens were coded in accord with a taxonomy of "information status" adapted from Prince 1992. Relevant here is whether a token referred to an entity that: (a) had been mentioned in already in the discourse; or (b) had not been mentioned already, but whose existence was plausibly inferrable from the existence of other entities in the discourse model; or (c) had not been mentioned before, and was not inferrable. Call tokens referring to entities with property (a) *D-Old*, with property (b) *Inferrable*, and with property (c) *D-New*. I was strict with what counted as *Inferrable*. Schools generally have principals, and babies have mothers, but much more elaborate guesswork did not constitute a plausible inference, in my estimation.

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[8] In some contexts, a bare NBAR string is indefinite or generic. The study was concerned only with non-generic bare NBAR definite descriptions.

The study shows that MDemPs are nearly always make the first explicit mention of the referent (90.5%), and are D-new fully 71.4% of the time. In extreme contrast, only 13.3% of BNDs are D-New. The remainder are split almost equally between D-Old and Inferrable. The discourse functions of these noun phrase types thus differ massively, despite their very similar semantics.

Discourse Status	MDemPs		BNDs	
D-Old	9.5 %	(8/84)	40.7 %	(104/255)
Inferrable	19.1	(16/84)	46.0	(117/255)
D-New	71.4	(60/84)	13.3	(34/255)

This discovery that MDemPs canonically introduce novel referents allows us to reduce our reliance on vague intuitions about when MDemPs are appropriately used. I suggest below that it may also explain why these have often been felt to be contrastive constructions.

The scope of the study did not include DemPs. In doing the research, however, it was apparent that DemPs were D-Old far more often than MDemPs were. DemPs seem to require a higher degree of salience in their referents—roughly as English demonstrative phrases require a more salient referent than definite descriptions (Gundel et al. 1993). Like its gloss ('the dog next door'), (3) can be used felicitously even if the hearer had no idea that my neighbors had a dog, as long a he finds the presupposition easy to accommodate. The DemP counterpart of (3), however—which I would gloss as *that dog next door*—is not felicitous in the same conditions. It requires antecedent knowledge of that particular dog.

4. Previous Accounts

Chao (1968) offered two enduring characterizations of MDemPs. He suggested (a) that pre-demonstrative modifiers correspond to *contrastively stressed* internal modifiers, and (b) that the pre-demonstrative modifiers have *restrictive* readings, while internal modifiers do not, and. The first suggestion is developed by Mary Wu (1994), and the second by C.-T. James Huang (1983) and Chu-Ren Huang (1987). In this section I show that neither position accords with the facts of MDemP usage. The restrictivity theory, moreover, has no account of the presuppositional differences between MDemPs and DemPs. I go on to reject as theoretically undesirable an analysis which treats the demonstrative determiner as ambiguous. Finally, before presenting my analysis in Section 5, I note the error in supposing that a relation of coreference obtains between the DEM+NBAR and a null-headed DP constituted by MOD.

4.1. Predemonstrative Modifiers as Contrastive

Chao (1968: 286) proposes that the DemP (22), with contrastive stress on the post-demonstrative modifier, has the same "sense" as the MDemP in (23).

(22) nei-wei DAI YANJING -de xiansheng
DEM$_1$ wear glasses -DE gentleman
Lit. 'that gentleman WEARING GLASSES'

(23) dai yanjing -de nei-wei xiansheng
wear glasses -DE DEM$_1$ gentleman
Lit. 'wearing glasses that gentleman'

Wu 1994 sees in this analogy a possible explanation for the universal cardinality presupposition of MDemPs, since contrastively stressing a modifier implies that no individual in the relevant context but the intended referent has the property expressed by that modifier.

Given that individuation does not entail rhetorical contrast, Wu's claim will be cogent only if a persuasive majority of MDemPs are in fact used contrastively. The corpus study mentioned above shows that this is not the case. Of the 84 unambiguous MDemP tokens I gathered, only two were convincingly contrastive in context, and just three more were arguably so. (I cannot include the corroborating data here, since it consists of very long segments of discourse, which make their point only in large numbers.) Plainly, MDemPs are not inherently or even typically contrastive constructions. These findings do actually accord with intuition. Recall examples (3) and (5). These do not generally evoke a contrast with the dogs who don't live next door or the guys who did not fix my sink last time. Contrast with non-dog things next door or with guys who fixed a non-sink last time (and so on) is no more likely. Such interpretations require special circumstances, and thus contrast is not an inherent feature of the MDemP.

Why then is the feeling that MDemPs are contrastive so common? I would like to suggest that its source is exactly the fact that MDemPs are typically D-New. Out of context, a form generally used to introduce novel referents perhaps invites the imagination of a context against which the referent has maximal novelty, and hence maximal contrast.

4.2. Predemonstrative Modifiers as Restrictive

Chao (1968: 286) also suggests that predemonstrative relative clauses are "restrictive," while those following the determiner are "descriptive." He clearly understands "descriptive" to entail nonrestrictive, and those who have followed Chao's suggestion have explicitly made this connection (C.-T. James Huang 1983, C.-R. Huang 1988, inter alia). Thus Chao would gloss (1) as 'that dog—which is yellow' and (2) as 'that yellow dog.'

Unfortunately, this claim cannot explain the general cardinality presupposition of MDemPs, as Wu 1994 points out, since restrictive modification does miraculously produce uniqueness presuppositions.[9] Chao's idea is therefore useless for current purposes.

Worse, it is arguably false, for two reasons.

First, there are environments in which nonrestrictive modification cannot occur. For example, a modifier associated with a nonspecific ('narrow scope') indefinite must be restrictive. Given a nonrestrictive reading of the modifier *fluffy*, and a nonspecific reading of the indefinite *a dog*, (24) is nonsense.

(24) * I want to buy a dog—which is fluffy.
(intended: *any* nonspecific dog; nonrestrictive relative)

(25) lacks this absurd reading entirely, despite the fact that the modifier *maorongrong-de* 'fluffy' follows the determiner. Hence modifiers following indefinite determiners cannot be non-restrictive.

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[9] Indeed, the presupposition of a nonrestrictively modified definite will always subsume that of its restrictively modified counterpart. Were post-demonstrative modifiers nonrestrictive, the DemP (1) would presuppose that U has only one dog, and add that it is yellow, while the restrictively modified (2) would require a single yellow dog, but allow for other dogs of different colors.

(25) wo xiangyao mai yi-zhi maorongrong-de gou
I want buy one fluffy-DE dog
'I want to buy a [any] dog that's fluffy.'

Inconveniently, dem-phrases cannot be subjected to this test, since they cannot be nonspecific. But if internal modifiers cannot be nonrestrictive following indefinite determiners, it seems unreasonable to assume that, under the demonstrative determiner, they must be.

Second, (1) would be a natural thing to say facing a scrum of playful dogs, not expecting the hearer could identify his intended referent without the information that it is yellow. So, while a rich context might render the descriptive content of any noun phrase unnecessary or redundant, a post-demonstrative modifier can be quite significant in establishing the reference of the phrase. It follows that, semantically, post-demonstrative modifiers are restrictive, in any reasonable sense of that term.[10]

4.3. Lexical Ambiguity

Li and Thompson propose that "the demonstrative *nei* 'that' … is beginning to function as 'the' if it is not stressed. For example: *Ni renshi bu renshi* [$_{\text{DemP}}$ *nei-ge ren*], 'Do you know that/the person?" (1981: 131, bracketing mine). Assuming this claim should entail its practical contrapositive (namely, that stress will force the pure demonstrative reading of *nei*) it cannot be perfectly correct. Were it, we should be baffled by the fact that (14)—wherein two identical MDemPs are conjoined, but their determiners are stressed—is still infelicitous. Thus the claim cannot be entirely right, at least with respect to the determiner in MDemPs, and so cannot be used to explain the description-like universal presupposition of these constructions.

Annear (1965, cited in Wu 1994) suggests that the demonstrative determiner itself changes its meaning, between 'the' and 'that,' depending on position vis-à-vis the modifiers. I submit without argument that this is a sort of lexical ambiguity better avoided. An account which can explain the meaning differences of the demonstrative phrases compositionally, without positing ambiguity, is to be preferred.

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[10] In an endnote (1983: 84), Huang writes that a modifier following the demonstrative determiner "is non-restrictive only in the sense that it does not specify the reference of the preceding demonstrative" though it is restrictive inasmuch as "it specifies a subclass [of the head noun]" If I understand this comment, it seems falsified by the example of the doggie scrum.

4.4. Local Coreference

One last candidate proposes that DEM$_n$+NBAR *refers to* the extension of the predemonstrative MOD. Mandarin permits headless DPs of the form MOD, which denote some set of relevant MOD things. Perhaps in (2), the predemonstrative MOD *huangse-de* ('yellow-DE') is a headless DP designating the contextually relevant yellow things, and the subsequent string *nei-zhi gou* ('DEM$_1$ dog') refers back to the members of that group. Yet that group will in general be much too large, and thus the speculation fails. There will often be more than one relevant yellow thing in the domain; and several yellow things cannot be referred to as *that dog*. Were only doghood contextually relevant, the set might shrink to the right size (namely, NUMERAL). But natural data show clearly that the property expressed by NBAR is often not salient in antecedent discourse. The local coreference theory is therefore irredeemable. Its main mistake is regarding DEM$_n$+NBAR as referring *to* the extension of the predemonstrative modifier MOD.[11] I will now argue that it is correctly taken to referring *in* that extension.

5. My Account: Predemonstrative Modifiers are Local Restrictions on the Domain

I claim that predemonstrative modifiers are lexical and syntactically encoded realizations of the local restriction from U to U/D characteristically associated with demonstrative phrases. To put it provocatively: in the semantics, predemonstrative modifiers are operationally equivalent to finger-pointings (inter alia). MDemPs are simply DemPs where the local domain-restriction is verbal and explicit within the scope of the demonstrative phrase itself, rather than supplied by context. I will say that the semantic interpretation of a demonstrative phrase contains a context variable M, which is instantiated either by MOD or by MOD$_{CXT}$, where MOD$_{CXT}$ denotes U/D, as specified by context at utterance. These conclusions follow directly from the data as analyzed in Section 3.

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[11] Two other problems with the coreference idea are that it would require unprecedented binding mechanisms to assure the strict locality of anaphora, and that, quite incorrectly, it would allow MOD and the following determiner to constitute distinct intonational phrases.

5.1. MOD is in Complementary Distribution with MOD$_{\text{CXT}}$

Demonstrative phrases, like (1) and its English translation, are characteristically open to context. NBAR does not saturate the function denoted by the dem-phrase; further restrictions on reference can be supplied by context. Conventionally, such context-dependence is formally encoded by adding a variable (of appropriate type) to the context-dependent function—a context variable—to be instantiated by information from outside the scope of the function (Chierchia 1995, Westerståhl 1989, among others). We may plausibly do the same for DEM$_n$ (as, in essence, does Kaplan 1977). In the semantic representation of a DemP, NBAR will instantiate one variable in DEM$_n$, but another will remain open, effectively an indexical over first-order predicates, serving to express the local restriction of U to U/D. Call this context variable M, and let MOD$_{\text{CXT}}$ be an abstract predicate such that $[|\text{MOD}_{\text{CXT}}|] = \text{U/D}$. (For example, MOD$_{\text{CXT}}$ might be *by-the-fountain.*) Now recall the observations in Section 3.

Based on sentences (8) and (12)–(15), I described DemPs as carrying a relative cardinality presupposition, and MDemPs a universal one. The presupposition of a DemP is relative to some provisional restriction of the domain, supplied at utterance. But that of an MDemP is fully determined by lexical content alone: context makes no further (truth-conditional) contribution. These conclusions were sloganized in (10) and (11), repeated here as (27) and (26), except that U/D in (10) is replaced by $[|\text{MOD}_{\text{CXT}}|]$ in (26).

(26) A DemP is felicitous only if, in U:

$$|\,[|\text{MOD}_{\text{CXT}}|] \cap [|\text{NBAR}|]\,| = \text{NUMERAL}.$$

(27) An MDemP is felicitous only if, in U:

$$|\,[|\text{MOD}|] \cap [|\text{NBAR}|]\,| = \text{NUMERAL}.$$

(26) and (27) invite an obvious generalization. DEM$_n$ is a function part of whose semantics is the requirement:

(28) $|\,[|X|] \cap [|\text{NBAR}|]\,| = \text{NUMERAL}.$

When there is a predemonstrative MOD, X is MOD, and when there isn't, X is MOD$_{\text{CXT}}$. Thus the interpretation of a Mandarin demonstrative phrase is completed *either* by a predemonstrative modifier *or* by a contextually supplied restriction—but not by both. In other words, MOD and MOD_{CXT} are in complementary distribution. This is *Thesis One* (T1).

(T1) Semantically, MOD is in complementary distribution with MOD_{CXT}.

Ideally, this fact should fall out of our compositional semantics for Mandarin. I therefore propose that predemonstrative MOD instantiates the very same variable otherwise instantiated by MOD_{CXT}, namely M. This is *Thesis Two* (T2). (T3) accommodates (T2) syntactically.

(T2) MOD and MOD_{CXT} 'compete' for the same variable M in the function denoted by DEM_n.

(T3) Modifiers preceding the demonstrative determiner map on the variable M in the semantics.

To handle context dependence, we posit a context variable in DEM_n. (T2) proposes that this variable is filled by MOD, when present; (T3) says that this MOD comes right before DEM_n. Predemonstrative position is thus presented as a syntactic reification, within the syntactic scope of DEM_n, of the variable in the semantics of demonstratives which expresses the local restriction of the domain.

These conclusions explain the contrast between (1) and (2) straightforwardly. (1) and (2) have the same overt descriptive content. But (1) denotes an open formula, while (2) is closed: the variable left free in (1) is instantiated by MOD in (2). Unless the free context variable in (1) is instantiated by redundant information, therefore, (1) and (2) will differ in their presuppositions.

Let us run through a concrete example. The subject of (29) is a MDemP, with NUMERAL=2. The subject of (30) is its DemP counterpart.

(29) maorongrong-de na-liang-zhi gou dou tai ke'ai le
fluffy-DE DEM_2 dogs both too cute LE
'The two fluffy dogs are just too cute.'

(30) na-liang-zhi maorongrong-de gou dou tai ke'ai le
DEM_2 fluffy-DE dog both too cute LE
'Those two fluffy dogs are just too cute.'

(29) is felicitous only if, in the set of fluffy things ([| MOD |]), there are exactly two dogs ([| NBAR |]). That is, there must be just two fluffy dogs in U generally. Compare (30). It requires that there be two fluffy dogs ([| NBAR |]) in some contextually defined subset of U_S ([| MOD_{CXT} |]). There could be more outside that set. Unless [| MOD_{CXT} |] is the set of fluffy things, then, (29) and (30) will not have the same presuppositions.

This analysis is simple and general. It is characteristic of demonstratives that they take an extra argument, beyond NBAR. That argument locally restricts the domain of reference. The data of Section 3 show that MOD, when present, assumes the role of this argument—that is, it instantiates the variable in DEM_n canonically filled by the contextual restriction. My account thus adds no new machinery. It adds only a detail, namely (T3): predemonstrative MOD is mapped into, and fills up, M. The semantics of MDemPs thus falls naturally out of the semantics of demonstratives generally. Nothing special needs to be said about either the demonstrative or the NBAR that follows it. Thus it explains the apparent differences between MDemPs and DemPs compositionally and without positing ambiguity or unattested constructional meanings. I return to the issue of compositionality in Section 5.4, and show how other theories require a non-compositional analysis.

5.2. The Formal Translation of DEM_n

(31) sketches a formal interpretation of DEM_n consonant with the claims made above. Here, DEM_n is regarded as a generalized quantifier with essentially the meaning of *the*, plus a context variable. (See Barwise & Cooper 1981, van der Does and van Eijk 1996, and Westerståhl 1989 for background.) The formalization follows the treatment of definites in Keenan & Stavi 1986. I simplify substantially by not representing the fact that DEM_n-phrases are always directly referential. Conceivably, this could be remedied by adding a "rigidifying operator" in the spirit of Kaplan 1977.

(31a) gives the truth-conditions for DEM_n, (31b) translates DEM_n as a λ-expression. Variables are in a sans-serif font, constants in roman. M, N, and P are variables over predicates in <e,t>. The variable names are mnemonic. Given the syntax, M will be instantiated by $\text{MOD}_{(\text{CXT})}$, N by NBAR, and P by some other predicate (e.g., the VP predicate when DEM_n is in the subject). As usual, '#' means that a presupposition is violated, and hence the expression lacks an uncontroversial truth-value. I introduce a propositional operator $\wp$ such that [| $\wp\varphi$ |] is undefined when φ is false—the idea being that the operand represents the content of a presupposition. Thus the first conjunct of the λ-expression in (31b) represents the cardinality presupposition associated with DEM_n. The second conjunct expresses the maximality condition typical of definites. In (31a), the presupposition is expressed in conditions (i) and (iii), and maximality in (ii) and (iv).

(31) a. $[|\, \text{DEM}_n\, (\mathsf{M}, \mathsf{N}, \mathsf{P})\, |]$

= 1, iff: (i) $|\, [|\, \mathsf{M}\, |] \cap [|\, \mathsf{N}\, |]\, | = \text{NUMERAL}$, and

(ii) $(\, [|\, \mathsf{M}\, |] \cap [|\, \mathsf{N}\, |]\,) \subseteq [|\, \mathsf{P}\, |]$

= #, iff: (iii) $|\, [|\, \mathsf{M}\, |] \cap [|\, \mathsf{N}\, |]\, | \neq \text{NUMERAL}$

= 0, only if: (iv) $(\, [|\, \mathsf{M}\, |] \cap [|\, \mathsf{N}\, |]\,) \not\subseteq [|\, \mathsf{P}\, |]$

b. $\text{DEM}_n =_{def} \lambda \mathsf{M}.\lambda \mathsf{N}.\lambda \mathsf{P}\, \wp(\text{EXACTLY-n}(\mathsf{M}, \mathsf{N}))\ \&$
$\forall x((\mathsf{M}(x)\ \&\ \mathsf{N}(x)) \rightarrow \mathsf{P}(x))$

$[|\, \text{EXACTLY-n}(A, B)\, |]$
= 1, iff: $|\, [|\, A\, |] \cap [|\, B\, |]\, | = \text{NUMERAL}$
= 0, otherwise.

$[|\, \wp\varphi\, |]$ = 1, iff $[|\, \varphi\, |] = 1$
= undefined, otherwise.

$[|\, \varphi\ \&\ \psi\, |]$ = 1, iff $[|\, \varphi\, |] = 1$ and $[|\, \psi\, |] = 1$
= 0, iff $[|\, \varphi\, |] = 0$ or $[|\, \psi\, |] = 0$
= #, otherwise.

(31a) says that (29) is true iff there are just two fluffy dogs (i), and all fluffy dogs are cute (ii). If there aren't just two fluffy dogs, (29) is infelicitous (iii). The sentence is false only if not all fluffy dogs are cute (iv). These are just the truth conditions of the English sentence *The two fluffy dogs are cute*. The truth conditions of (30), with a DemP subject, would be those of *The two fluffy and* M *dogs cute*, where M is given by context.

What the truth conditions are is less important than how, compositionally, we arrive at them. DEM_n is looking for M and N. The syntax arranges for it to find both in the DP, M on its left, and N on its right. (More in 5.4.) When there is no modifier to the left of DEM_n, M is left open to context. (If it is technically convenient to avoid free variables, M can be filled by a proform over first-order predicates when there is no MOD. I will not trouble with this issue here, and will continue to speak of **M** remaining free.) Conversely, when there is a predemonstrative modifier, *it* instantiates **M** and the phrase loses its sensitivity to context. We thereby express the conclusions reached above. In the composition of the MDemP (2), the predemonstrative *huangse-de* 'yellow' fills **M** and *gou* 'dog' fills **N**. But in (1), the two terms combine to fill a single argument, **N**, leaving **M** open for context. The contrast follows.

Of course, there is an unlimited number of logically equivalent alternatives to (31). As long as we have three available variables, two from within the noun phrase, the critical points can be made. Whether this particular representation is attractive—independently of the inadequacies admitted at the start of this section—will depend on a variety of theoretical commitments, which I will not discuss here.

One aspect of (31) may be representationally quite useful, however. The cardinality presupposition DEM_n is represented by a conservative quantifier, EXACTLY-n(**M**, **N**), whose restriction is instantiated by the context argument $\text{MOD}_{(\text{CXT})}$. Within dynamic approaches to semantics, it is often argued that the body of a conservative quantifier is evaluated only in that set of worlds and assignment functions which satisfy its restriction (Chierchia 1995, van den Berg 1996).[12] Applying this understanding to EXACTLY-n($\text{MOD}_{(\text{CXT})}$, NBAR), we have it that NBAR is evaluated only in the set denoted by $\text{MOD}_{(\text{CXT})}$. The peculiar way (31) represents the cardinality presupposition of a DEM_n-phrase thus encodes the intuition that, when I point towards the fountain and say *that yellow dog*, I am not so much further restricting the NBAR as I am restricting the domain in which there must be a unique yellow dog.[13] This intuition is of course of no truth-conditional consequence, but I would prefer to give it voice somewhere in the formalism.

---

[12] In a traditional semantics, quantificational relations hold between the interpretations of the restriction and of the body in the same set of worlds/assignments. See Groenendijk, Stokhof & Veltman 1996 for the advantages of the procedural perspective on evaluation defended in dynamic semantics.

[13] Since EXACTLY-n(A,B) is conservative *and* symmetric, it is trivially equivalent to a one-place relation over the intersection of its arguments. Obviously my proposal depends on taking the quantifier to be dyadic by definition, not by necessity.

5.3. The Problem of 'Non-Intersective' Modifiers Is Only Apparent

Scalar and non-restrictive adjectives, like *enormous* and *imaginary* respectively, present a prima facie challenge to (31). Similar adjectives can occur predemonstratively in Mandarin. If these must denote functions from common noun denotations to common noun denotations (<<e,t>,<e,t>>), then (31) is unattractive, since it takes $\mathrm{MOD}_{(\mathrm{CXT})}$ to denote in <e,t>. In our definition, we should have to change all instances of $(M \cap N)$ to $(M(N))$, and EXACTLY-n(M,N) to EXACTLY-n(M(N)). (The restriction and body of a quantifier cannot have different types.) Also, were it necessary that $\mathrm{MOD}_{(\mathrm{CXT})}$ sometimes denote in <<e,t>,<e,t>>, the story of $\mathrm{MOD}_{(\mathrm{CXT})}$ as a local restriction of the domain would be difficult to express formally, since the domain is a set of individuals, not predicates.

Conveniently for me, it is not necessary. I see no significant differences between the (a) and (b) sentences in (32) and (33).

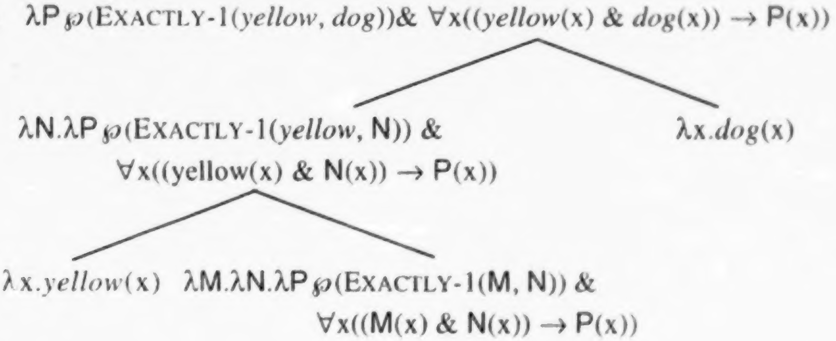
(32) a. Lester hugged an enormous tree.
b. Lester hugged a tree that was enormous.

(33) a. I have an imaginary friend.
b. I have a friend who's imaginary.

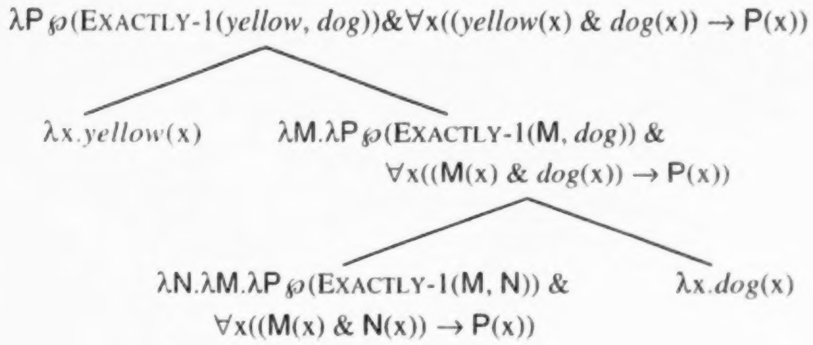
This, despite the fact that *enormous* and *imaginary* in the (b) sentences do not, at any traditional level of representation, take *tree* and *friend* as arguments. It is therefore *necessary* to have an account of scalar and nonintersective adjectives which can explain their peculiar effects even when they clearly do not take the relevant common noun as an argument. Whatever this account is, it will sanction the assumption that $\mathrm{MOD}_{(\mathrm{CXT})}$ denotes uniformly in <e,t>. (See Partee 1995 for extensive discussion of related issues.)

5.4. Composition and Syntax

(31b) entails the following composition for example phrase (2). Let *huangse-de=yellow* and let *gou=dog.*

(34)

$\lambda P \wp(\textsc{Exactly-1}(\mathit{yellow}, \mathit{dog})) \& \forall x((\mathit{yellow}(x) \& \mathit{dog}(x)) \rightarrow P(x))$
$\lambda N.\lambda P \wp(\textsc{Exactly-1}(\mathit{yellow}, N)) \& \forall x((\mathrm{yellow}(x) \& N(x)) \rightarrow P(x))$
$\lambda x.\mathit{dog}(x)$
$\lambda x.\mathit{yellow}(x)$
$\lambda M.\lambda N.\lambda P \wp(\textsc{Exactly-1}(M, N)) \& \forall x((M(x) \& N(x)) \rightarrow P(x))$

That DEM$_n$ should apply first to MOD, and then the result to NBAR, perhaps accords impressionistically with the idea of MOD as a DP-local domain restriction, but it is not necessitated by the semantics. Reversing the order of λM and λN in (31b) yields the logically equivalent (35).

(35)

$\lambda P \wp(\textsc{Exactly-1}(\mathit{yellow}, \mathit{dog})) \& \forall x((\mathit{yellow}(x) \& \mathit{dog}(x)) \rightarrow P(x))$
$\lambda x.\mathit{yellow}(x)$
$\lambda M.\lambda P \wp(\textsc{Exactly-1}(M, \mathit{dog})) \& \forall x((M(x) \& \mathit{dog}(x)) \rightarrow P(x))$
$\lambda N.\lambda M.\lambda P \wp(\textsc{Exactly-1}(M, N)) \& \forall x((M(x) \& N(x)) \rightarrow P(x))$
$\lambda x.\mathit{dog}(x)$

The coordination facts, however, prefer the structure in (34). MOD and DEM$_n$ can coordinate, as in (36), independently of NBAR. This is evidence that MOD and DEM$_n$ form a constituent. DEM$_n$ and NBAR, on the other hand, cannot coordinate under a predemonstrative modifier. This is shown by (37), which cannot mean that the fish is yellow.

(36) [huangse-de nei-zhi he hei-de nei-zhi] gou
yellow-DE DEM$_1$ and black DEM$_1$ dog
'The yellow and the black dog' (one of each)

(37) * huangse-de [nei-zhi gou he nei-tiao yu]
yellow -DE DEM$_1$ dog and DEM$_1$ fish
* On the reading: 'The yellow dog and the [yellow] fish'

On a different parse, the string in (37) could mean 'the yellow dog and that fish,' where what is coordinated would be two full DPs. But it cannot have the reading given, which assumes the distribution of the modifier over both conjuncts. This argues that, in an MDemP, DEM$_n$ and NBAR do not form a constituent independent of MOD. Hence we have support for the tree in (34).

Of course, (35), but not (34), looks isomorphic to the standard, uniformly right-branching X-bar structure customarily assigned to Mandarin DPs (Huang 1982, Tang 1996). I will leave open the question of whether any other hard syntactic facts (e.g., binding facts) recommend this conventional structure over the otherwise well-motivated (34).

Independent of this potential disagreement, my analysis offers a substantial syntactic fringe benefit: I avoid having to posit transformational movement of the predemonstrative modifier.

Other theories do not challenge the default assumption that MOD restricts the head noun—that is, combines with the head noun in the semantics. Given this, MOD cannot occupy its surface position at interpretation without composition operating over nonadjacent items, which I take to be undesirable on principle. Hence Huang, Wu and everybody else would have to move MOD to the neighborhood of NBAR. Unfortunately, positing a movement relation between pre- and post-DEM$_n$ positions doesn't bring anybody any closer to explaining the meaning difference between (1) and (2). Worse, it threatens to conflate their meanings altogether.

Compare my analysis. The semantics I propose produces the *effect* of MOD restrictively modifying NBAR (these two properties jointly determine the referent), just not by combining the predicates before they are swallowed by DEM$_n$. MOD and NBAR instantiate distinct variables in DEM$_n$. Since DEM$_n$ is adjacent to both, function application can proceed directly and only over terms contiguous at surface structure. Importantly, the valence of DEM$_n$ is not increased willy-nilly, just to avoid moving MOD: the extra variable M is needed to encode the fact that NBAR alone does not saturate DEM$_n$. The insight of this paper is that this variable allows us to explain the presuppositional contrast between (1) and (2), given the empirical thesis (T1). Here we see that it also allows a minimal syntax. Thus, my account solves the semantic and the syntactic problems posed by predemonstrative modifiers in one and the very same stroke.

6. Extensions

6.1. Topics "Chinese-style"

Implicitly, (T2) and (T3) posit an interesting difference between English and Chinese: Mandarin (sometimes) realizes the context variable overtly in demonstrative phrases, but English does not. If true, this not only substantiates the linguistic reality of such variables (see Williams *in review*), but discovers an interesting dimension of cross-linguistic variation in the syntax-semantics mapping, one which I will now suggest ramifies elsewhere in Mandarin.

English does not syntactically realize the demonstrative context variable. So, when the local domain *is* restricted verbally, that restriction is perforce periphrastic and appositive, as with phrases like *As for the area by the fountain*. Mandarin, on the other hand, has the option of a restricting predicate occurring bare, in a fixed, non-appositive syntactic position—like a real argument. The comparison to the syntactic option of "topics Chinese-style" (Chafe 1976), or "double subject" constructions (Li & Thompson 1981), is irresistible.

These topics, exemplified in (38)–(40) are neither arguments of the verb, nor coreferent with any argument of the verb.

(38) nei-xie shu shushen da (Chafe 1976)
$\text{DEM}_{\text{plural}}$ tree trunk big
'Those trees, the trunks are big.'

(39) jiaju jiu-de hao (Li & Thompson 1981)
furniture old-DE good
'Furniture, old is good.'

(40) zhei-ban xuesheng ta zui congming (Li & Thompson 1981)
DEM-class students s/he most intelligent
'[In] this class of students, s/he is the most intelligent.'

A distinguishing feature of such topics is exactly that they are non-periphrastic. Were they to occur within a Mandarin version of *As for X*, they could hardly be considered especially "Chinese-style." But it is clear that their similarity to predemonstrative modifiers does not end with their syntactic parsimony. Chafe (1976) writes that: "What the topics appear to do is limit the applicability of the main predication to a certain restricted domain. The bigness of trunks [(38)] applies within the domain of those trees." According to Li & Thompson (1981): "[T]he topic is the *whole* of which the subject is a *part*. [In (38)], the subject is *possessed* by the topic, while in [(39) and (40)], the topic names a class and the subject names a *subset* of that class." I propose to generalize these analyses by saying that the topic restricts the universe of discourse to just the set it denotes, and the subsequent subject is evaluated in that set. Trunks within the set of these trees are big; old things within the set of furniture are good; s/he within the set of these students is intelligent. That is, I claim the apparatus developed for predemonstrative modifiers can be used to handle topics of the "double subject" type.[14] From this perspective, we might call predemonstrative modifiers 'DP topics,' or the sentential topics 'IP context arguments.' This would be a welcome result, as it would minimize the amount of special machinery needed to explain the distinctive characteristics of Mandarin syntax, and its interface with semantics.

6.2. Indefinites

Modifiers may also precede the determiner in Mandarin indefinites—that is, precede the sequence NUMERAL + CLASSIFIER.

(41) a. yi-zhi huangse-de gou
one-CLS yellow-DE dog
b. huangse-de yi-zhi gou
yellow-de one-CLS dog
'a/one yellow dog'

(42) a. liang-ge wo gege mai -de pingguo
two-CLS I brother buy -DE apple
b. wo gege mai -de liang-ge pingguo
I brother buy -DE two-CLS apple
'two apples my brother bought'

In a simple world, the apparatus designed for predemonstrative modifiers would handle (41b) and (42b) as well, with minimal adjustments and (ideally) with some explanatory benefits. I want to briefly explore the supposition that we are in the simplest world possible: the prenumeral modifier is a local domain restriction, an instantiation of a context variable, in exactly the sense discussed above for demonstratives, and hence (41b) says there is one dog *in the set of yellow things.* Can this idea be maintained?

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[14] Whether the domain restriction here should be local to the subject, or span the entire sentence is not perfectly clear.

The first thing to appreciate is that numeral determiners say only that *at least N* things of a certain type are in the domain, and so there cannot be the same contrast between (41a) and (41b) as there is between (1) and (2). (41a), in which nothing precedes the numeral determiner, says (I am supposing) that there is at least one yellow dog in some subset of U. (I return to the question of *which* subset.) There may be more than one yellow dog in that subset and/or elsewhere in U. (41b), in which *huangse-de* 'yellow' precedes the determiner, says that there is *at least* one dog in the set of yellow things. There may be more than one dog in that set, and so, more than one yellow dog in U. Both (41a) and (41b), then, will say U has one yellow dog and possibly more. There is no contrast here. Consequently, the theory proposed above is at least consistent with the logical semantics.

But (41a) and (41b) do differ somehow in meaning, their similarities notwithstanding. I have no satisfying account of how. The common intuition that they differ in 'emphasis' may be true, but it contributes little to an interesting theory of these constructions. One possible if obscure lead towards a more ambitious theory is suggested by the main idea of this paper, namely that predemonstrative modifiers are kin to contextually given restrictions on reference. Perhaps placing a modifier before the determiner enforces a subtle presupposition, that the set the modifier evokes is already part of, or is relevantly related to, the discourse context. To flesh this out, we might propose that (41b) and (42b) have the feel of a partitive, something like: *one dog of the yellow ones*, and *two apples of those my brother bought.* (Compare: *one yellow dog*, and *two apples my brother bought*, glosses we would assign to the (a) cases.) Preliminary research in this direction is encouraging but inconclusive: speakers' intuitions are unclear and variable.

The second fact to appreciate is that indefinites are not characteristically accompanied by deictic gestures. In the absence of an overt prenumeral modifier, then, what will fill the putative context variable? One option is to stipulate that, in the absence of a prenumeral modifier, the variable is instantiated by the universal predicate. That is, the local domain is just U by default. As stipulations go, this one would not be egregious. It is just a formal expression of the banal observation that demonstratives are more sensitive to context than definite or indefinite descriptions, made within a theory generalizes the apparatus needed for the complex case to the simpler case. The only alternative is an invitation to further research. We might investigate whether Mandarin indefinites do not in fact show telling sensitivities to context. In particular, given the speculation above, we should want to determine whether, in certain contexts, they are preferentially read as implicit (quasi-) partitives, that is, as "d-linked" indefinites in the sense of Pesetsky (1987). Again, research in this direction is up in the air. For now, I align myself with the stipulation, and await the results of further work.

6. Summary and Conclusion

The present analysis of predemonstrative modifiers in Mandarin is simple, compositional, and consonant with the facts of actual usage. Recognizing the distinctive context-sensitivity of demonstratives, I expand the valence of the function DEM_n, introducing a variable to be instantiated by context. This is standard. What I add is the thesis that, when there is a predemonstrative modifier, it instantiates exactly this variable, closing the function to context, and thereby keeping its cardinality presupposition from being relativized to a smaller domain. The data support this thesis convincingly. Two string-identical MDemPs—like two identical DemPs accompanied by coextensional deictic gestures—cannot felicitously cooccur, ever. Hence predemonstrative modifiers must fill the context variable. To inscribe this conclusion in the syntax, the context variable is realized in the predemonstrative position. The semantics of MDemPs thus falls naturally out of the semantics of demonstratives generally. We achieve an analysis which is compositional at surface structure and does not posit dubious ambiguities or movements. What special tools the theory does use are themselves stimulating: if Mandarin realizes the context variable syntactically, then we have both an interesting fact about natural language semantics, and a very promising lead on how to handle other constructions that seem to involve fixing local domains of evaluation, like "Chinese-style" sentence topics. Most importantly, the theory delivers an explanation of the basic contrast between the presuppositions of (1) and (2), without claiming that predemonstrative modifiers have some special interpretation, not borne out by natural data. More subtle differences between (1) and (2), with less effect on the truth-functional semantics, are best discovered through analysis of large bodies of real discourse. Some progress towards this end is reported above. Corpus-based study will be especially useful to the understanding of pre-determiner modifiers in cardinal indefinites, since there, brute semantic effects are not visible.

Much remains to be argued and discovered, of course. I argued that Mandarin projects context variables syntactically; it follows that these variables are linguistically 'real' (see Williams *in review*). Even so, a finer logic for deixis and the dynamics of local domain restriction should have to be worked out. A fuller account of the syntax of predemonstratively modified noun phrases is also necessary; I have had space only for some very coarse observations here. The extensions discussed in Section 6 certainly warrant further research as well. But not just to protect the present theory: the ideas of Section 6 seem to be of some promise in handling other facets of the Mandarin syntax-semantics interface. The suggestion that predemonstrative modifiers and topics "Chinese style" are two buds of the same plant is particularly stimulating. The question of whether the proposals made for Mandarin are of utility cross-linguistically is one last invocation to continued investigation.

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